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TRANSACTIONS

OF THE

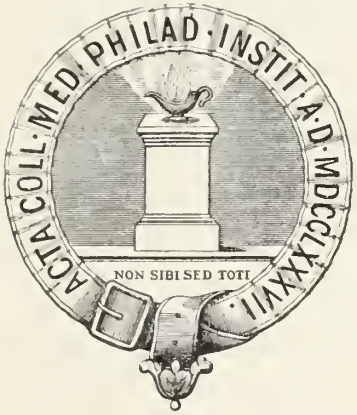
COLLEGE OF PHYSICIANS

OF

PHILADELPHIA.

THIRD SERIES.

VOLUME THE TWENTY-SEVENTH.



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NOTICE.

The present volume of TRANSACTIONS contains the papers read before the College from January, 1905, to December, 1905, inclusive.

The Committee of Publication thinks it proper to say that the College holds itself in no way responsible for the statements, reasonings, or opinions set forth in the various papers published in its TRANSACTIONS.

EDITED BY

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COLLEGE OF PHYSICIANS OF PHILADELPHIA.

1905.

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Clerk, Francis R. Packard, M.D.

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OF THE

PRESIDENTS OF THE COLLEGE FROM THE TIME OF ITS INSTITUTION.

ELECTED	
1787	JOHN REDMAN
1805	WILLIAM SHIPPEN
1809	ADAM KUHN
1818	THOMAS PARKE
1835	THOMAS C. JAMES *
1835	THOMAS T. HEWSON
1848	GEORGE B. WOOD
1879	W. S. W. RUSCHENBERGER
1883	ALFRED STILLÉ
1884	SAMUEL LEWIS †
1884	J. M. DA COSTA
1886	S. WEIR MITCHELL
1889	D. HAYES AGNEW
1892	S. WEIR MITCHELL
1895	J. M. DA COSTA
1898	JOHN ASHHURST, JR.
1900	W. W. KEEN
1902	HORATIO C. WOOD
1904	ARTHUR V. MEIGS

* Died four months after his election.
† Resigned on account of ill-health.

FELLOWS

OF THE

COLLEGE OF PHYSICIANS OF PHILADELPHIA.

DECEMBER, 1905.

* Non-resident Fellows.
† Fellows who have commuted dues.

ELECTED

*1883. Abbot, Griffith E., Ph.D., M.D., Washington, D. C.

1892. Abbott, Alex. C., M.D., Professor of Hygiene and Bacteriology, and Director of the Laboratory of Hygiene in the University of Pennsylvania.

1905. Adler, Lewis H., Jr., M.D., Professor of Diseases of the Rectum in the Philadelphia Polyclinic and College for Graduates in Medicine; Prosector to the Professor of Anatomy in the University of Pennsylvania; Consulting Surgeon to the Charity Hospital.

1903. Allen, Alfred Reginald, M.D.

1873. Allis, Oscar H., M.D., Surgeon to the Presbyterian Hospital.

1896. Allyn, Herman B., M.D., Associate in Medicine in the University of Pennsylvania; Physician to the Philadelphia Hospital; Clinical Professor of Medicine in the Woman's Medical College of Pennsylvania.

1888. Anders, James M., M.D., LL.D., Professor of the Theory and Practice of Medicine and Clinical Medicine in the Medico-Chirurgical College; Physician to the Medico-Chirurgical and Samaritan Hospitals.

1869. Andrews, T. Hollingsworth, M.D.

1896. Angney, William M., M.D., Physician to the House of Mercy (Home for Male Consumptives); Consulting Physician to the Hospital for Diseases of the Lungs, at Chestnut Hill.

ELECTED

1905. Anspach, Brooke M., M.D., Gynecologist and Obstetrician to the Philadelphia Hospital; Assistant Gynecologist to the University Hospital; Instructor in Gynecology in the University of Pennsylvania.

1905. Appleman, Leighton F., M.D., Demonstrator of Pharmacy and Materia Medica, and Instructor in Therapeutics in the Jefferson Medical College; Instructor in Ophthalmology in the Philadelphia Polyclinic and College for Graduates in Medicine; Ophthalmologist to the Frederick Douglass Memorial Hospital.

*1882. Ashbridge, Richard, M.D., West Whiteland, Pa.

1893. Ashton, Thomas G., M.D., Adjunct Professor of Medicine in the University of Pennsylvania; Physician to the Philadelphia Hospital.

1857. Atlee, Walter Franklin, A.M., M.D., Corresponding Member of La Société des Sciences Médicales de Lyons; Consulting Surgeon to St. Luke's Hospital, Bethlehem; Visiting Physician to the Preston Retreat.

1852. Bache, Thomas Hewson, M.D.

1903. Bacon, John, M.D.

†1892. Baker, George Fales, B.S., M.D.

1889. Baldy, John Montgomery, M.D., Professor of Gynecology in the Philadelphia Polyclinic; Surgeon to the Gynecean Hospital and to the Gynecological Out-patient Department of the Pennsylvania Hospital; Consulting Surgeon to the Frederick Douglass Memorial Hospital.

1898. Balliet, Tilghman M., A.M., M.D., Professor of Therapeutics at Dartmouth College, Hanover, N. H.; Physician to the Old Man's Home.

1883. Baum, Charles, A.M., M.D., Ph.D.

1883. Beates, Henry, M.D.

1860. Benner, Henry D., M.D.

1874. Bennett, W. H., A.M., M.D., Physician-in-Charge to the Seashore Home for Invalid Children, and to the Seaside House for Invalid Women, Atlantic City; formerly Physician to the Episcopal Hospital, and Physician-in-Charge to St. Christopher's Hospital for Children.

ELECTED

1896. Beyea, Henry D., M.D., Associate in Gynecology and Assistant Demonstrator of Obstetrics in the University of Pennsylvania; Assistant Surgeon to the Gynecean Hospital.

†1884. Biddle, Alexander W., M.D.

1884. Biddle, Thomas, M.D.

1903. Biggs, Montgomery H., M.D., Chief Resident Physician of the Philadelphia Hospital.

1904. Birney, Herman H., M.D.

*1866. Black, J. J., M.D., New Castle, Del.

1894. Bliss, Arthur Ames, M.D., Laryngologist and Aurist to the German Hospital; Consulting Laryngologist to the Pennsylvania Institution for the Deaf and Dumb.

*1867. Boardman, Charles H., M.D.

1894. Bochroch, Max H., M.D., Demonstrator of Neurology, and Chief Clinical Assistant in the Nervous Department of the Jefferson Medical College Hospital; Neurologist to the Outpatient Department of St. Joseph's Hospital.

1896. Boger, John A., M.D., Surgeon to St. Mary's Hospital; Surgeon to the Dispensary of the Episcopal Hospital.

1891. Boyd, George M., M.D., Clinical Professor of Obstetrics in the Medico-Chirurgical College; Physician to the Philadelphia Lying-in Charity Hospital and Nurse School.

†1884. Bradford, T. Hewson, M.D.

1903. Branson, Thomas F., M.D., Attending Physician to the Bryn Mawr Hospital.

1856. Brinton, John H., M.D., LL.D., Professor of the Practice of Surgery and of Clinical Surgery in the Jefferson Medical College; Consulting Surgeon to St. Joseph's Hospital and to the Southwestern Hospital of Philadelphia.

1891. Brinton, Lewis, M.D., Visiting Physician to the Nervous Department of the Howard Hospital.

1900. Brinton, Ward, M.D., Demonstrator of Physical Diagnosis in the Jefferson Medical College; Physician to the Dispensary of St. Christopher's Hospital for Children; Assistant in Medical Dispensary of Jefferson Medical College Hospital.

1887. Brubaker, Albert P., M.D., Professor of Physiology in the Pennsylvania College of Dental Surgery; Adjunct Professor of Physiology and Hygiene in the Jefferson Medical College; Lecturer on Anatomy and Physiology in the Drexel Institute.

ELECTED

*1890. Brush, Edward N., M.D., Medical Superintendent of the Shepherd and Enoch Pratt Hospital, Towson, Md.

*1851. Bullock, William R., M.D., Wilmington, Del.

1892. Burr, Charles W., M.D., Professor of Mental Diseases in the University of Pennsylvania; Neurologist to the Philadelphia Hospital.

*1886. Cadwalader, Charles E., M.D.

1905. Cameron, George A., M.D., Physician to the Germantown Hospital.

1905. Carmany, Harry S., M.D., Surgeon to St. Timothy's Hospital, Roxborough; Surgeon to the Dispensary of the Episcopal Hospital.

1905. Carpenter, Herbert B., M.D., Physician to the Dispensary of the Children's Hospital.

1895. Carpenter, John T., M.D., Lecturer on Ophthalmology in the University of Pennsylvania; Assistant Ophthalmic Surgeon to the University Hospital; Attending Ophthalmologist to the Bryn Mawr Hospital.

*1897. Carter, William S., M.D., Professor of Physiology in the University of Texas.

1892. Cattell, Henry W., A.M., M.D., Editor of *Medical Notes and Queries;* Author of *Post-mortem Pathology;* American Editor and Translator of Ziegler's *Special Pathological Anatomy;* Editor of Lippincott's *Medical Dictionary.*

*1892. Cerna, David, M.D., Ph.D., Monclova, Coah, Mexico; Corresponding Fellow of the Sociedad Española de Higiene of Madrid.

1900. Chance, Burton, M.D., Assistant Surgeon to the Wills Eye Hospital; Ophthalmologist to the Germantown Hospital.

1885. Chapin, John B., M.D., Physician-in-Chief to the Pennsylvania Hospital for the Insane.

1880. Chapman, Henry C., M.D., Professor of the Institutes of Medicine and of Medical Jurisprudence in the Jefferson Medical College.

1900. Chase, Robert Howland, A.M., M.D., Superintendent of the Friends' Asylum for the Insane.

*1868. Cheston, D. Murray, M.D.

1897. Cheston, Radcliffe, M.D.

ELECTED

1904. Christian, Hilary M., M.D., Clinical Professor of Genito-Urinary Diseases in the Medico-Chirurgical College; Professor of Genito-Urinary Diseases in the Philadelphia Polyclinic.

1903. Chrystie, Walter, M.D.

1899. Clark, John G., M.D., Professor of Gynecology in the University of Pennsylvania; Gynecologist-in-Chief to the University Hospital.

1897. Claxton, Charles, A.M., M.D.

1872. Cleemann, Richard A., M.D.

1896. Cleveland, Arthur H., M.D., Clinical Professor of Laryngology in the Medico-Chirurgical College; Laryngologist to the Medico-Chirurgical Hospital; Laryngologist and Aurist to the Presbyterian Hospital, and to the Pennsylvania Institution for the Deaf and Dumb.

1903. Coates, George M., M.D., Surgeon to the Dispensary of the Children's Hospital; Instructor in Otology in the Philadelphia Polyclinic; Visiting Physician to the Philadelphia Orphanage; Major and Surgeon, 2d Regiment, National Guard of Pennsylvania.

1888. Cohen, Solomon Solis, M.D., Professor of Clinical Medicine in the Jefferson Medical College; Physician to the Jefferson Medical College Hospital, to the Philadelphia Hospital, to the Jewish Hospital and to the Rush Hospital.

1898. Coles, Stricker, M.D., Demonstrator and Clinical Lecturer on Obstetrics in the Jefferson Medical College; Assistant Obstetrician to the Jefferson Maternity.

1901. Coley, Thomas Luther, A.B., M.D., Attending Physician to the Methodist Episcopal Hospital of Philadelphia.

1903. Cooper, J. Cardeen, M.D., Consulting Physician to the Methodist Home for the Aged.

1903. Coplin, W. M. L., M.D., Professor of Pathology in the Jefferson Medical College; Pathologist to and Director of the Laboratories of the Jefferson Medical College Hospital; Pathologist to the Philadelphia Hospital and to the Friends' Asylum for the Insane, Frankford; Bacteriologist to the Pennsylvania State Board of Health.

1904. Craig, Frank A., M.D., Assistant Instructor in Medicine in the University of Pennsylvania; Member of Staff of the Henry Phipps Institute; Examining Physician to the Free Hospital for Poor Consumptives.

ELECTED

1895. Cross, William A., M.D., Consulting Physician to the Jewish Hospital.

1904. Cruice, John M., M.D., Instructor in Medicine in the University of Pennsylvania; Assistant Physician to the Philadelphia Hospital; Physician to the Medical Dispensary of the University Hospital and of St. Joseph's Hospital.

1902. Currie, Charles A., M.D., Physician to the Germantown Hospital.

1884. Curtin, Roland Gideon, A.M., M.D., Ph.D., Physician to the Philadelphia and to the Presbyterian Hospitals; Consulting Physician to St. Timothy's Hospital and to the Rush Hospital for Consumptives.

1884. Da Costa, John C., M.D., Emeritus Gynecologist to the Jefferson Medical College Hospital; Consulting Gynecologist to St. Agnes's Hospital.

1903. Da Costa, John C., Jr., M.D., Demonstrator of Clinical Medicine in the Jefferson Medical College; Chief of the Medical Clinic in the Jefferson Medical College Hospital; Assistant Physician to the Philadelphia Hospital; Hæmatologist to the German Hospital.

1896. Da Costa, John Chalmers, M.D., Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College; Surgeon to the Philadelphia and to St. Joseph's Hospitals.

1887. Daland, Judson, M.D., Professor of Clinical Medicine in the Medico-Chirurgical College; Physician to the Medico-Chirurgical Hospital; Consulting Physician to the Kensington Hospital for Women; Consulting Physician to the State Hospital for the Insane at Norristown.

1859. Darrach, James, M.D., Consulting Surgeon to the Germantown Hospital.

1896. Davis, Charles N., M.D., Dermatologist to the Pennsylvania Hospital; Consulting Dermatologist to St. Agnes's Hospital; Assistant Physician in the Dispensary for Skin Diseases in the Howard Hospital.

1888. Davis, Edward P., A.M., M.D., Professor of Obstetrics in the Jefferson Medical College and in the Philadelphia Polyclinic; Visiting Obstetrician to the Jefferson and to the Polyclinic Hospitals; Obstetrician and Gynecologist to the Philadelphia

ELECTED

Hospital; Member of the American Gynecological Society, the American Pediatric Society, and of the International Congress of Obstetrics and Gynecology.

1889. Davis, Gwilym G., M.D. (Univ. of Penna. and Goettingen), M.R.C.S. Eng., Associate Professor of Applied Anatomy in the University of Pennsylvania; Surgeon to the Episcopal, to St. Joseph's and to the Orthopædic Hospitals.

1900. Davisson, Alex. Heron, M.D., Physician to the Dispensary of the Children's Hospital.

1894. Deaver, Harry C., M.D., Surgeon to the Episcopal and to St. Mary's Hospitals, and to St. Christopher's Hospital for Children.

1887. Deaver, John B., M.D., Surgeon-in-Chief to the German Hospital; Consulting Surgeon to the Germantown Hospital.

1892. Deaver, Richard Wilmot, M.D., Surgeon to the Germantown Hospital.

1902. Dehoney, Howard, M.D.

1885. Dercum, Francis X., M.D., Professor of Nervous and Mental Diseases in the Jefferson Medical College; Neurologist to the Philadelphia Hospital; Consulting Neurologist to St. Agnes's and to the Jewish Hospitals, and to the State Asylum for the Chronic Insane of Pennsylvania.

1891. Dixon, Samuel G., M.D., President and Executive Curator of the Academy of Natural Sciences of Philadelphia; Member of the Council of the American Philosophical Society; Member of the Board of Trustees of the Wistar Institute of Anatomy; Member of the Board of Managers of the Philadelphia Zoölogical Society.

*1896. Donnellan, P. S., M.D., L.R.C.S. and P., Ireland, Phœnix, Arizona, Laryngologist to St. Agnes's Hospital; Medical Examiner of the Mutual Life Insurance Company of New York.

1897. Dorland, W. A. Newman, M.D., Associate in Gynecology in the Philadelphia Polyclinic and College for Graduates in Medicine; Assistant Instructor in Obstetrics in the University of Pennsylvania.

1902. Dougherty, Sherborne W., M.D., Instructor in Physical Diagnosis in the University of Pennsylvania; Physician to the Dispensary of the German Hospital; Assistant Physician to the Methodist Hospital.

ELECTED

1893. Downs, Norton, M.D.

1864. Downs, R. N., M.D., Consulting Physician to the Germantown Hospital.

1902. Downs, Robert N., Jr., M.D., Surgeon to the Dispensary of the Germantown Hospital.

1864. Duer, Edward L., A.M., M.D., Gynecologist to the Presbyterian Hospital; Consulting Obstetrician to the Maternity Hospital and to the Preston Retreat.

1897. Duer, S. Naudain, M.D., Physician to the Dispensary of the Presbyterian Hospital.

1871. Duhring, L. A., M.D., Professor of Dermatology in the University of Pennsylvania.

1881. Dulles, Charles Winslow, M.D., Lecturer on the History of Medicine in the University of Pennsylvania; Surgeon to the Rush Hospital.

*1871. Dunglison, Thomas R., M.D., Rosny sous Bois (Seine), France.

*1860. Dunton, William R., M.D., Montrose, Pa.

1899. Edsall, David L., M.D., Assistant Professor of Medicine in the University of Pennsylvania; Woodward Fellow in Chemistry in the William Pepper Laboratory of Clinical Medicine; Physician to the Episcopal Hospital.

*1887. Edwards, William A., M.D., Los Angeles, California; Professor of Pediatrics in the Medical Department of the University of Southern California.

1904. Elmer, Walter G., M.D., Chief Resident Physician to, and Surgeon to the Out-patient Department of the Presbyterian Hospital; Assistant Orthopedic Surgeon to the University Hospital; Consulting Physician to the Church Home for Children.

1896. Ely, Thomas C., A.M., M.D.

1901. Erck, Theodore A., M.D., Assistant Surgeon to the Gynecean Hospital; Associate in Gynecology in the Philadelphia Polyclinic and College for Graduates in Medicine; Gynecologist to the Frederick Douglass Memorial Hospital.

1893. Eshner, Augustus A., M.D., Professor of Clinical Medicine in the Philadelphia Polyclinic and College for Graduates in Medicine; Physician to the Philadelphia Hospital; Assistant Physician to the Orthopædic Hospital and Infirmary for

ELECTED

Nervous Diseases; Physician to the Hospital for Diseases of the Lungs, at Chestnut Hill.

1868. Evans, Horace Y., A.M., M.D.

1905. Evans, Joseph S. Jr., M.D., Registrar to the Professor of Medicine in the University Hospital; Assistant Physician to the Philadelphia Hospital; Associate in the William Pepper Laboratory of Clinical Medicine; Instructor in Clinical Medicine in the University of Pennsylvania.

1905. Evans, William, M.D.

1894. Faries, Randolph, M.D.

1903. Farr, Clifford B., M.D., Physician to the Methodist Hospital; Instructor in Physical Diagnosis in the University of Pennsylvania; Instructor in Diseases of the Stomach in the Philadelphia Polyclinic; Assistant Physician in the Medical Dispensary of the Hospital of the University of Pennsylvania.

1893. Farr, William W., M.D., Physician to the Leamy Home.

1884. Fenton, Thomas H., M.D., Medical Director and Senior Ophthalmologist to the Union Mission Hospital; Ophthalmologist to St. Vincent's Home, to the Home for Aged Couples, to the Baptist Home and to the House of the Good Shepherd.

1884. Fisher, Henry M., M.D., Physician to the Out-patient Department of the Pennsylvania Hospital.

*1900. Flexner, Simon, M.D., Director of the Rockefeller Institute, New York City; Member of the Association of American Physicians; Corresponding Member of La Societa Medico-Chirurgica di Bologna.

1888. Flick, Lawrence F., M.D.

1862. Forbes, William S., M.D., Professor of Anatomy in the Jefferson Medical College; Clinical Surgeon to the Jefferson Medical College Hospital.

*†1885. Fox, Joseph M., M.D., Leesburg, Va.

1903. Francine, Albert P., A.M., M.D., Instructor in Medicine in the University of Pennsylvania; Physician to the Medical Dispensary of the University Hospital; Member of the Staff of Phipps Institute; Medical Registrar to the Philadelphia Hospital.

ELECTED

1897. Frazier, Charles H., M.D., Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to the University, to the Philadelphia and to the Episcopal Hospitals; Surgeon to the Home for Crippled Children.

†1890. Freeman, Walter J., M.D., Professor of Laryngology in the Philadelphia Polyclinic; Laryngologist to the Orthopædic Hospital; Consulting Laryngologist to the Pennsylvania Institution for the Deaf and Dumb.

1893. Friebis, George, M.D., Ophthalmic Surgeon to the Lutheran Home and Orphanage, Mt. Airy.

1899. Furness, William H., 3d, M.D.

1889. Fussell, M. Howard, M.D., Assistant Professor of Medicine in the University of Pennsylvania; Physician to St. Timothy's Hospital; Physician to St. Mary's Hospital.

1899. Gamble, Robert G., M.D., one of the Attending Physicians to the Bryn Mawr Hospital.

1873. Gerhard, George S., M.D., Physician-in-Chief to the Bryn Mawr Hospital; Consulting Physician to Bryn Mawr College; Consulting Physician to Villa Nova College.

1864. Getchell, F. H., M.D.

1902. Ghriskey, Albert A., M.D., Clinical Pathologist to the Episcopal Hospital.

1892. Gibb, Joseph S., M.D., Professor of Diseases of the Throat and Nose in the Philadelphia Polyclinic; Surgeon to the Ear, Nose and Throat Department of the Episcopal Hospital.

1899. Gibbon, John H., M.D., Surgeon to the Pennsylvania Hospital; Surgeon to the Bryn Mawr Hospital; Consulting Surgeon to the Woman's Hospital; Associate Professor of Surgery in the Jefferson Medical College.

1897. Girvin, John H., M.D., Physician for Diseases of Women at the Presbyterian Hospital; Instructor in Obstetrics in the University of Pennsylvania.

1889. Githens, William H. H., M.D., Visiting Physician to the Sheltering Arms.

1905. Givin, Ellis E. W., M.D., Assistant Surgeon to the Jewish Maternity Hospital; Surgeon to the Dispensary of the Episcopal Hospital; Surgeon to the Dispensary of St. Christopher's Hospital for Children; Assistant Prosector to the

ELECTED

Associate Professor of Applied Anatomy in the University of Pennsylvania.

1894. Gleason, E. B., M.D., Clinical Professor of Otology in the Medico-Chirurgical College; Surgeon-in-Charge of the Nose, Throat, and Ear Department of the Northern Dispensary.

1884. Godey, Harry, M.D.

1893. Goodell, W. Constantine, M.D.

1905. Gordon, Alfred, M.D., Chief of the Clinic and Demonstrator of Nervous and Mental Diseases in the Jefferson Medical College; Examiner of the Insane at the Philadelphia Hospital; Neurologist to the Douglass Memorial Hospital; Neurologist to the Mount Sinai Hospital.

†1897. Gould, George M., A.M., M.D.

1894. Graham, Edwin E., M.D., Professor of Pediatries in the Jefferson Medical College; Pediatrist to the Jefferson and to the Philadelphia Hospitals; Physician to the Franklin Reformatory Home.

1885. Graham, John, M.D.

1904. Grayson, Charles P., M.D., Clinical Professor of Laryngology and Rhinology in the University of Pennsylvania; Physician-in-Charge of Throat and Nose Department of the University Hospital; Oto-Laryngologist to the Philadelphia Hospital.

1883. Griffith, J. P. Crozer, M.D., Clinical Professor of the Diseases of Children in the University of Pennsylvania; Physician to St. Agnes's, to the Children's and to the Methodist Hospitals.

*1889. Guitéras, John, M.D.

1902. Gwyn, Norman B., M.B., Instructor in Medicine in the University of Pennsylvania.

*1893. Hamill, Robert H., M.D., Summit, N. J.

1894. Hamill, Samuel McC., M.D., Professor of Diseases of Children in the Philadelphia Polyclinic and College for Graduates in Medicine; Pediatrist to the Howard Hospital.

1897. Hand, Alfred, Jr., M.D., Visiting Physician to the Children's Hospital, to the Children's Hospital of the Mary J. Drexel Home of Philadelphia and to the Methodist Hospital.

1886. Hansell, Howard F., M.D., Professor of Ophthalmology in the Jefferson Medical College; Ophthalmic Surgeon to

ELECTED

the Philadelphia Hospital and to the Jefferson Medical College Hospital; Emeritus Professor of Diseases of the Eye in the Philadelphia Polyclinic.

1889. Hare, Hobart A., M.D., Professor of Therapeutics in the Jefferson Medical College; Physician to the Jefferson Medical College Hospital.

1865. Harlan, George C., M.D., Consulting Surgeon to the Wills Eye Hospital; Ophthalmic Surgeon to Pennsylvania Hospital, and to the Pennsylvania Institution for the Blind; Emeritus Professor of Diseases of the Eye in the Philadelphia Polyclinic.

1902. Harland, William G. B., M.D., Instructor in Laryngology in the University of Pennsylvania; Instructor in Otology in the Philadelphia Polyclinic; Laryngologist to the Phipps Institute for Tuberculosis, and to the Philadelphia Home for Incurables.

1903. Hart, Charles D., M.A., M.D., Physician to the Out-patient Department of the Pennsylvania Hospital; Inspector of the Eastern Penitentiary.

1885. Harte, Richard H., M.D., Associate Professor of Surgery in the University of Pennsylvania; Surgeon to the Pennsylvania and to the Orthopædic Hospitals; Consulting Surgeon to St. Mary's, to St. Timothy's and to the Bryn Mawr Hospitals.

1888. Hartzell, Milton B., M.D., Associate in Dermatology in the University of Pennsylvania; Dermatologist to the Methodist Episcopal Hospital.

1872. Hays, I. Minis, M.D.

1882. Hearn, W. Joseph, M.D., Professor of Clinical Surgery in the Jefferson Medical College; Surgeon to Philadelphia Hospital.

1901. Heisler, John C., M.D., Professor of Anatomy in the Medico-Chirurgical College.

1884. Henry, Frederick P., M.D., Physician to the Philadelphia Hospital; Professor of the Principles and Practice of Medicine in the Woman's Medical College of Pennsylvania.

1903. Henry, J. Norman, M.D., Physician to the Out-patient Department of the Pennsylvania Hospital; Assistant Physician to the Philadelphia Hospital; Clinical Instructor in Medicine in the Woman's Medical College of Pennsylvania; Physician-in-Charge of the De Lancey School.

ELECTED

1891. Hewson, Addinell, A.M., M.D., Demonstrator of Anatomy in the Jefferson Medical College; Professor of Anatomy in the Philadelphia Polyclinic and College for Graduates in Medicine; Surgeon to St. Timothy's Hospital, Roxborough.

1872. Hinkle, A. G. B., M.D.

1897. Hinkle, William M., M.D., Lecturer on the Anatomy and Physiology of the Vocal Organs in the National School of Elocution and Oratory.

*1892. Hinsdale, Guy, A.M., M.D., Hot Springs, Virginia, Secretary of the American Climatological Association; Corresponding Member of the British Balneological and Climatological Society; ex-President of the Pennsylvania Society for the Prevention of Tuberculosis.

1888. Hirsh, A. Bern., M.D., Physician to the Home for Aged Couples.

1888. Hirst, Barton Cooke, M.D., Professor of Obstetrics in the University of Pennsylvania; Gynecologist to the Philadelphia and to the Howard Hospitals.

1903. Hirst, John Cooke, M.D., Assistant Obstetrician to the University and the Philadelphia Hospitals; Attending Physician to the Maternity Hospital and to the Gynecological Dispensary of the Howard Hospital; Consulting Obstetrician to the Southeastern Dispensary.

*1894. Hoch, William R., M.D., Pueblo, Col.

1905. Hodge, Edward B., Jr., M.D., Surgeon to the Out-patient Department of the Pennsylvania Hospital; Assistant Surgeon to the Orthopædic Hospital; Dispensary Surgeon to the Presbyterian Hospital; Dispensary Surgeon to the Children's Hospital.

1885. Holland, James W., M.D., Professor of Medical Chemistry and Toxicology in the Jefferson Medical College.

1888. Horwitz, Orville, M.D., Professor of Genito-urinary Diseases in the Jefferson Medical College; Surgeon to the Jefferson Medical College Hospital, to the Philadelphia Hospital and to the State Hospital for the Insane; Consulting Surgeon to the Jewish Hospital.

1892. Hughes, William E., M.D., Visiting Physician to the Philadelphia Hospital; Pathologist to the Presbyterian Hospital.

ELECTED

1898. Hutchinson, James P., M.D., Surgeon to the Pennsylvania, to the Methodist, to the Children's, to St. Timothy's and to the Bryn Mawr Hospitals; Adjunct Professor of Surgery in the University of Pennsylvania.

1871. Ingham, James V., M.D.

*1885. Jackson, Edward, M.D., Denver, Col., Professor of Ophthalmology in the University of Colorado; Emeritus Professor of Diseases of the Eye in the Philadelphia Polyclinic; Ophthalmologist to the Denver City and County Hospital.

1887. Jayne, Horace, M.D., Ph.D.

1898. Johnson, Russell H., A.B. (Princeton), M.D., Physician to the Pennsylvania Institution for the Deaf and Dumb.

1900. Jones, Charles James, A.M., M.D., Ophthalmic Surgeon to the House of the Good Shepherd, Germantown; Assistant Surgeon to the Wills Eye Hospital.

1900. Jopson, John H., M.D., Surgeon to the Children's, to the Presbyterian and to the Bryn Mawr Hospitals, and to the Philadelphia Home for Incurables.

1885. Judd, Leonardo da Vinci, M.D.

1900. Judson, Charles F., A.B., M.D., Physician to St. Christopher's Hospital for Children, to the Southern Home for Destitute Children and to the Sheltering Arms.

1902. Jump, Henry D., M.D., Instructor in Medicine in the University of Pennsylvania; Assistant Physician to the Medical Dispensary of the University Hospital.

1886. Jurist, Louis, M.D.

1903. Kalteyer, Frederick J., M.D., Demonstrator of Clinical Medicine in the Jefferson Medical College; Chief of the Out-patient Department, Assistant Attending Physician and Hæmatologist to the Jefferson Medical College Hospital; Pathologist to the Philadelphia Lying-in-Charity.

1904. Kane, J. A. Bayard, M.D.

†1867. Keen, William W., M.D., LL.D., (Hon.) F.R.C.S. (Eng. and Edin.), Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College; Membre Correspondant Étranger de la Société de Chirurgie de Paris; Honorary Member of the Société Belge de Chirurgie and of

ELECTED

the Clinical Society of London; Ehrenmitglied der Deutschen Gesellschaft für Chirurgie.

1897. Kelly, Aloysius O. J., M.D., Associate in Medicine in the University of Pennsylvania; Assistant Physician to the University Hospital; Clinical Professor of Pathology in the Woman's Medical College of Pennsylvania; Visiting Physician to St. Mary's and to St. Agnes's Hospitals; Pathologist to the German Hospital.

*1887. Kelly, Howard A., M.D., Professor of Gynecology in Johns Hopkins University and Gynecologist to the Johns Hopkins Hospital, Baltimore, Md.

1898. Kempton, Augustus F., M.D.

1905. Kercher, Delno E., M.D.

1902. King, William Howard, M.D.

1895. Kneass, Samuel S., M.D., Associate in the William Pepper Laboratory of Clinical Medicine in the University of Pennsylvania.

1904. Krauss, Frederick, M.D., Ophthalmic Surgeon to St. Christopher's Hospital for Children and Dispensary; Instructor in Ophthalmology in the Philadelphia Polyclinic.

1905. Kremer, Walter H., M.D.

1900. Krusen, Wilmer, M.D., Instructor in Gynecology in Jefferson Medical College; Assistant Gynecologist and Chief of the Gynecological Dispensary of St. Joseph's Hospital; Consulting Gynecologist to the Children's Hospital in Germantown.

1897. Kyle, D. Braden, A.M., M.D., Professor of Laryngology in the Jefferson Medical College; Consulting Laryngologist, Rhinologist, and Otologist to St. Agnes's Hospital and to the Philadelphia Home for Incurables; Laryngologist to the New Jersey Training School for Feeble-minded Children; Bacteriologist to the Orthopædic Hospital and Infirmary for Nervous Diseases.

1865. La Roche, C. Percy, M.D.

*1892. Laine, Damaso T., M.D., Havana, Cuba.

1904. Landis, Henry R. M., M.D., Visiting Physician to the White Haven Sanatorium; Member of the Staff of the Henry Phipps Institute; Assistant Visiting Physician to the Philadelphia Hospital.

ELECTED

1904. Le Boutillier, Theodore, M.D., Physician to the Dispensary of St. Christopher's Hospital for Children; Instructor in Diseases of Children in the Philadelphia Polyclinic; Registrar to the Medical Dispensary of the Children's Hospital; Visiting Physician to the Baptist Orphanage and Haddock Memorial Home.

1893. Le Conte, Robert G., A.B., M.D., Surgeon to the Pennsylvania, to the Children's and to the Bryn Mawr Hospitals; Consulting Surgeon to the Germantown Hospital.

1887. Leaman, Henry, M.D.

1903. Leffmann, Henry, A.M., M.D., D.D.S., Ph.D., Professor of Chemistry and Toxicology in the Woman's Medical College of Pennsylvania; Professor of Chemistry in the Wagner Free Institute of Science; Pathological Chemist to the Jefferson Medical College Hospital; Chemist to the State Board of Health of Pennsylvania.

1892. Leidy, Joseph, M.D., Consulting Physician to the Pennsylvania Training School for Feeble-minded Children.

1903. Leonard, Charles Lester, M.D.

1877. Lewis, Morris J., M.D., Emeritus Physician to the Children's Hospital; Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases and to the Pennsylvania Hospital.

1904. Lindauer, Eugene, M.D., Instructor in Clinical Medicine in the Philadelphia Polyclinic.

1886. Lloyd, J. Hendrie, M.D., Neurologist to the Philadelphia Hospital; Physician to the Methodist Episcopal Hospital and to the Home for Crippled Children; Consulting Neurologist to the State Asylum for the Chronic Insane of Pennsylvania and to the Pennsylvania Training School for Feeble-minded Children.

1900. Lodge, John W., M.D., Consulting Physician to the Bryn Mawr Hospital.

1893. Longaker, Daniel, M.D., Surgeon to the Jewish Maternity Hospital.

1877. Longstreth, Morris, M.D.

1900. McCarthy, Daniel J., M.D., Instructor in Neurology in the Philadelphia Polyclinic; Associate of the William Pepper Laboratory of Clinical Medicine.

ELECTED

1875. McCLELLAN, GEORGE, M.D., Consulting Surgeon to the Howard Hospital.

1903. McCONNELL, GUTHRIE, M.D., Demonstrator of Pathology in the Medico-Chirurgical College; Assistant Pathologist to the Philadelphia Hospital; Pathologist to the Howard Hospital; Assistant Pathologist to the Polyclinic Hospital.

1895. McFARLAND, JOSEPH, M.D., Professor of Pathology and Bacteriology in the Medico-Chirurgical College; Pathologist to the Medico-Chirurgical and the Philadelphia Hospitals.

1905. McKENZIE, ROBERT TAIT, A.B., M.D., Professor of Physical Education and Director of the Department of Physical Education in the University of Pennsylvania.

1900. McREYNOLDS, ROBERT PHILLIPS, M.D., one of the Resident Chiefs and one of the Chiefs of the Gynecological Dispensary of the Presbyterian Hospital.

1886. MACCOY, ALEXANDER W., M.D., Surgeon for Diseases of the Nose and Throat in the Out-patient Department of the Pennsylvania Hospital; Member of the American Laryngological Society.

1905. MACINTOSH, JAMES W., M.D.

1901. MACLEOD, GEORGE I., JR., M.D., Assistant Physician and Registrar to the Bryn Mawr Hospital.

1896. MAKUEN, G. HUDSON, M.D., Professor of Defects of Speech in the Philadelphia Polyclinic; Laryngologist to St. Mary's Hospital and to the Frederick Douglass Memorial Hospital; Visiting Consultant on Defects of Speech to the New Jersey Training School for Feeble-minded Children.

*1885. MALLET, JOHN WILLIAM, M.D., Ph.D. (Goett.), LL.D. (Princeton and Johns Hopkins), F.R.S., Professor of Chemistry in the University of Virginia.

1898. MARSHALL, GEORGE MORLEY, M.D., Laryngologist to the Philadelphia Hospital; Physician and Laryngologist to St. Joseph's Hospital.

1893. MARSHALL, JOHN, M.D., Nat. Sc. D., LL.D., Professor of Chemistry and Toxicology in the University of Pennsylvania.

1889. MARTIN, EDWARD, M.D., Professor of Clinical Surgery in the University of Pennsylvania; Surgeon to University, Howard, Philadelphia, and Bryn Mawr Hospitals.

ELECTED

1885. Mays, Thomas J., M.D., Visiting Physician to the Rush Hospital.

*1868. Mears, J. Ewing, M.D.

1875. Meigs, Arthur V., M.D., Physician to the Pennsylvania Hospital; Consulting Physician to the Pennsylvania Institution for the Instruction of the Blind.

*1884. Mifflin, Houston, M.D., Columbia, Pa.

1894. Miller, D. J. Milton, M.D., Visiting Physician to the Episcopal and to the Children's Hospitals.

1881. Mills, Charles K., M.D., Professor of Neurology in the University of Pennsylvania; Neurologist to the Philadelphia Hospital.

1904. Mitchell, Charles F., M.D., Surgeon to the Out-patient Department of the Pennsylvania Hospital; Assistant Surgeon to the Orthopædic Hospital and Infirmary for Nervous Diseases; Associate in Surgery in the Philadelphia Polyclinic.

†1888. Mitchell, John K., M.D., Assistant Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases; Assistant Neurologist to the Presbyterian Hospital; Attending Physician to the Pennsylvania Training School for Feeble-minded Children.

1856. Mitchell, S. Weir, M.D., M. Nat. Ac. Sci., LL.D. (Edinburgh), Corresponding Member of French Academy of Medicine; Assembly für innere Medicin, Berlin; Member of the Royal Medical Society.

1882. Montgomery, Edward E., M.D., Professor of Gynecology in the Jefferson Medical College; Gynecologist to the Jefferson Medical College Hospital and to St. Joseph's Hospital.

1886. Morris, Caspar, M.D.

1893. Morris, Elliston J., M.D., Physician to the Episcopal Hospital, to the Sheltering Arms and to the Midnight Mission.

1883. Morris, Henry, M.D., Professor of Anatomy in the Woman's Medical College of Pennsylvania; Senior Visiting Physician to St. Joseph's Hospital; Associate Member, Military Surgeons of U. S. A.

1856. Morris, J. Cheston, M.D.

1897. Morton, Samuel W., M.D.

1891. Morton, Thomas S. K., M.D.

ELECTED

1864. Moss, William, M.D.

1904. Moulton, Albert R., M.D., Senior Assistant Physician to the Pennsylvania Hospital for the Insane; Physician to the Out-patient Department for Nervous and Mental Diseases at the Pennsylvania Hospital; Professor of Mental Diseases in the Maine Medical School (Bowdoin College).

1905. Müller, George P., M.D., Instructor in Surgery in the University of Pennsylvania; Assistant Surgeon to the Philadelphia Hospital; Assistant Surgeon to the Home for Crippled Children; Assistant Pathologist to the German Hospital.

1882. Musser, John H., M.D., Professor of Clinical Medicine in the University of Pennsylvania; Physician to the University the Philadelphia and the Presbyterian Hospitals.

1905. Mutschler, Louis H., M.D., Surgeon to the Dispensary of the Episcopal Hospital; Surgeon to the Dispensary of St. Christopher's Hospital for Children; Assistant Surgeon to the Orthopædic Hospital.

1896. Myers, T. D., M.D., Lecturer on Ophthalmology in the U. S. Navy Medical School.

1902. Nassau, Charles F., M.D., Surgeon to St. Joseph's Hospital; Physician to Dispensary for Women of the German Hospital.

1886. Neff, Joseph S., M.D.

1887. Neilson, Thomas Rundle, A.M., M.D., Surgeon to the Episcopal Hospital and to St. Christopher's Hospital for Children; Clinical Professor of Genito-Urinary Diseases in the University of Pennsylvania.

1905. Newcomet, William S., M.D.

1905. Newlin, Arthur, M.D., Physician to the Dispensary of the Children's Hospital; Assistant Physician to the Orthopædic Hospital.

1899. Nicholson, William R., Jr., M.D., Assistant Instructor in Obstetrics in the University of Pennsylvania; Obstetrician to Maternity Hospital; Assistant Surgeon to Gynecean Hospital.

1889. Noble, Charles P., M.D., Surgeon-in-Chief to the Kensington Hospital for Women; Surgeon-in-Charge of the Department for Women of the Northern Dispensary and of the

ELECTED

Union Mission Hospital; Clinical Professor of Gynecology in the Woman's Medical College of Pennsylvania; Lecturer on Gynecology in the Philadelphia Polyclinic.

*1893. Noble, William H., M.D.

1898. Nolan, Edward J., M.D., Recording Secretary and Librarian of the Academy of Natural Sciences of Philadelphia.

1905. Norris, Charles C., M.D., Instructor in Gynecology in the University of Pennsylvania; Assistant Gynecologist to the Philadelphia and to the Howard Hospitals.

1905. Norris, George William, A.B., M.D., Instructor in Medicine in the University of Pennsylvania; Assistant Physician to the Philadelphia Hospital; Physician to the Henry Phipps Institute for the Study, Prevention and Treatment of Tuberculosis; Physician to the Dispensary of the Episcopal Hospital.

1901. Norris, Henry, M.D., Chief of the Surgical Dispensary of the Hospital of the University of Pennsylvania; Clinical Assistant in the Clinic for Genito-Urinary Surgery in the Polyclinic Hospital.

1869. Norris Herbert, M.D.

1865. Norris, Isaac, M.D.

1892. Norris, Richard C., M.D., Lecturer on Clinical and Operative Obstetrics in the University of Pennsylvania; Obstetrician in Charge to the Preston Retreat; Visiting Obstetrician to the Philadelphia Hospital; Gynecologist to the Methodist Hospital and Consulting Obstetrician and Attending Gynecologist to the Southeastern Dispensary and Hospital.

1884. Oliver, Charles A., A.M., M.D., Surgeon to the Wills Eye Hospital; Ophthalmic Surgeon to the Philadelphia and to the Presbyterian Hospitals; Associate Clinical Professor of Ophthalmology in the Woman's Medical College of Pennsylvania.

1884. O'Neill, J. Wilks, M.D.

*1885. Osler, William, M.D., Regius Professor of Medicine in Oxford University, England.

1903. Ostheimer, Maurice, M.D., Instructor in Pediatrics in the University of Pennsylvania; Physician to the Medical Dispensary of St. Christopher's Hospital for Children; Registrar in the Medical Dispensary of the Children's Hospital.

ELECTED

1897. Packard, Francis R., M.D., Aurist to the Out-patient Department of the Pennsylvania Hospital; Professor of Diseases of the Ear in the Philadelphia Polyclinic and College for Graduates in Medicine; Consulting Aurist to the Bryn Mawr Hospital; Editor of the *American Journal of the Medical Sciences*.

1858. Packard, John H., M.D., Late Surgeon to the Pennsylvania Hospital; Surgeon Emeritus to St. Joseph's Hospital.

1898. Page, Henry F., M.D., Assistant Physician to the German Hospital and Physician to the Medical Dispensary of the same; Instructor in Clinical Medicine in the Woman's Medical College of Pennsylvania; Physician to the Baptist Home.

1899. Parke, William E., M.D., Assistant Surgeon in the Department for Diseases of Women in the Northern Dispensary; Clinical Assistant and Surgeon to the Dispensary of the Kensington Hospital for Women.

*1903. Pearce, Richard M., M.D., Director of the Bender Laboratory, Albany, N. Y.; Professor of Pathology in the Albany Medical School; Director of the Bureau of Pathology and Bacteriology of the New York State Board of Health.

†1889. Penrose, Charles Bingham, M.D., Ph.D. (Harvard), Formerly Professor of Gynecology in the University of Pennsylvania.

1854. Penrose, R. A. F., M.D., LL.D., Professor (Emeritus) of Obstetrics and Diseases of Women and Children in the University of Pennsylvania.

†1902. Pepper, William, M.D., Instructor in Medicine in the University of Pennsylvania.

1884. Perkins, Francis M., M.D., Ophthalmic Surgeon to St. Agnes's Hospital.

1905. Pfahler, George E., M.D., Director of the Röntgen Ray Laboratory, and Assistant Physician to the Medico-Chirurgical Hospital; Lecturer on Medical Terminology and Symptomatology, and Demonstrator of Physical Diagnosis in the Medico-Chirurgical College.

1899. Phillips, John L., M.D.

1883. Piersol, George A., M.D., Professor of Anatomy in the University of Pennsylvania.

ELECTED

1905. Pitfield, Robert L., M.D., Pathologist to the Germantown Hospital; Bacteriologist to the Chestnut Hill Hospital for Lung Diseases.

1872. Porter, William G., M.D., Consulting Physician to the Philadelphia Dispensary and to the Educational Home for Boys.

1896. Posey, William Campbell, M.D., Surgeon to the Wills Eye Hospital; Professor of Ophthalmology in the Philadelphia Polyclinic and College for Graduates in Medicine; Ophthalmic Surgeon to the Howard Hospital; Ophthalmologist to the Pennsylvania Hospital for Epileptics.

1902. Potts, Barton H., M.D., Laryngologist and Aurist to the German and to St. Mary's Hospitals; Assistant Aural Surgeon and Chief of the Ear Dispensary of the Children's Hospital; Laryngologist to the Pennsylvania Training School for Feeble-Minded Children.

1899. Potts, Charles S., M.D., Associate in Neurology in the University of Pennsylvania; Assistant Neurologist to the University Hospital; Neurologist to the Philadelphia Hospital; Consulting Physician to the Hospital for the Insane, Atlantic County, New Jersey.

1905. Prendergast, Michael T., M.D.

†1899. Price, Joseph, M.D., Obstetric Physician to the Philadelphia Dispensary.

1903. Purves, George Morehouse, M.D., Registrar of the Surgical Dispensary of the Hospital of the University of Pennsylvania.

1903. Pyle, Walter L., M.D., Assistant Surgeon to the Wills Eye Hospital.

1887. Randall, B. Alexander, M.A., M.D., Clinical Professor of Diseases of the Ear in the University of Pennsylvania; Ear Surgeon to the Children's Hospital; Consulting Aurist to the Pennsylvania Institution for the Deaf and Dumb and to St. Timothy's Hospital.

1904. Ravenel, Mazyck P., M.D., Assistant Medical Director and Attending Physician to the Henry Phipps Institute.

1887. Reed, Charles H., M.D.

1885. Reichert, Edward T., M.D., Professor of Physiology in the University of Pennsylvania.

ELECTED

1897. Rhein, John H. W., M.D., Neurologist to St. Agnes's Hospital; Physician to the Philadelphia Home for Incurables; Bacteriologist to the Pennsylvania Training School for Feeble-minded Children.

1891. Rhoads, Edward G., M.D.

1898. Riesman, David, M.D., Professor of Clinical Medicine in the Philadelphia Polyclinic; Associate in Medicine in the University of Pennsylvania; Physician to the Philadelphia and to the Jewish Hospitals.

1895. Ring, G. Oram, M.D., Ophthalmic Surgeon to the Episcopal Hospital; Ophthalmic and Aural Surgeon to the Samaritan Hospital.

1905. Risley, J. Norman, M.D., Assistant Surgeon to the Wills Eye Hospital; Ophthalmologist to the Pennsylvania Training School for Feeble-Minded Children.

1891. Risley, S. D., M.D., Attending Surgeon to the Wills Eye Hospital; Professor (Emeritus) of Ophthalmology in the Philadelphia Polyclinic and College for Graduates in Medicine; Member of the Board of Managers of the Pennsylvania Training School for Feeble-minded Children; Alumnus Manager of the University Hospital.

†1878. Roberts, John B., M.D., Professor of Surgery in the Philadelphia Polyclinic; Surgeon to the Methodist Hospital.

1899. Roberts, Walter, M.D., Instructor in Otology in the Philadelphia Polyclinic; Clinical Assistant for Diseases of the Nose and Throat in the Out-patient Department of the Pennsylvania Hospital; Laryngologist to the Philadelphia Hospital.

1903. Robertson, William Egbert, M.D., Assistant Visiting Physician and Chief of Dr. Daland's Clinic in the Medico-Chirurgical Hospital; Lecturer to Nurses in the Medico-Chirurgical Hospital; Pathologist to the Episcopal Hospital.

1902. Robinson, James Weir, M.D., Assistant Surgeon to the Presbyterian Hospital.

1903. Robinson, William Duffield, M.D.

1900. Rodman, William L., M.D., Professor of the Principles of Surgery and Clinical Surgery in the Medico-Chirurgical College; Professor of the Principles and Practice of Surgery in the Woman's Medical College of Pennsylvania.

ELECTED

1898. Ross, George G., M.D., Assistant Surgeon to the German Hospital and Surgeon to the Out-patient Department of the same; Surgeon to the Germantown Hospital.

1905. Rugh, James Torrance, M.D., Orthopedic Surgeon to the Methodist Hospital; Demonstrator of Orthopedic Surgery in the Jefferson Medical College; Assistant Orthopedist to the Jefferson Hospital; Assistant Orthopedist to the Philadelphia Hospital.

1897. Sailer, Joseph, M.D., Associate in Medicine in the University of Pennsylvania; Associate of the Pepper Clinical Laboratory of the University of Pennsylvania; Pathologist to the Pennsylvania Training School for Feeble-minded Children.

1900. Sajous, Charles E. de M., M.D.

1905. Sartain, Paul J., M.D.

1899. Schamberg, Jay F., M.D., Professor of Dermatology and Infectious Eruptive Diseases in the Philadelphia Polyclinic and College for Graduates in Medicine; Assistant Physician to the Municipal Hospital for Infectious Diseases.

1887. de Schweinitz, George E., M.D., Professor of Ophthalmology in the University of Pennsylvania; Ophthalmic Surgeon to the Philadelphia Hospital; Consulting Ophthalmic Surgeon to the Philadelphia Polyclinic; Ophthalmologist to the Orthopædic Hospital and Infirmary for Nervous Diseases

1895. Scott, J. Alison, M.D., Adjunct Professor of Medicine in the University of Pennsylvania; Visiting Physician to the Pennsylvania Hospital; Physician to the Church Home for Children.

1892. Seiss, Ralph W., M.D., Professor of Otology in the Philadelphia Polyclinic; Consulting Laryngologist to the Pennsylvania Institution for the Deaf and Dumb.

1897. Sharpless, William T., M.D., Physician to the Chester County Hospital, West Chester, Pa.

1876. Shippen, Edward, A.M. (Princeton), M.D., Medical Director U. S. Navy (retired).

1891. Shober, John B., A.M., M.D., Associate Gynecologist to the Gynecean Hospital; Gynecologist to the Howard Hospital; Obstetrician to the Philadelphia Hospital.

ELECTED

1890. Shoemaker, George Erety, A.M., M.D., Gynecologist to the Presbyterian Hospital and to the Pennsylvania Epileptic Hospital and Colony Farm; Consulting Surgeon to the Woman's Hospital of Philadelphia.

†1893. Shoemaker, Harvey, M.D., Visiting Physician to the Sheltering Arms and to the Southern Home for Destitute Children; Assistant Physician to the German Hospital; Physician to the Out-patient Department of the German and to the Pennsylvania Hospitals.

†1896. Shoemaker, William T., M.D., Ophthalmic Surgeon to the Germantown Hospital; Assistant Ophthalmologist and a Chief of Clinic to the German Hospital; Dispensary Ophthalmic Surgeon to the Presbyterian Hospital; Oculist to Pennsylvania Institution for the Deaf and Dumb.

1900. Shumway, Edward Adams, B.S., M.D., Instructor in Ophthalmology in the University of Pennsylvania; Assistant Ophthalmic Surgeon to the University and to the Philadelphia Hospitals; Ophthalmologist to the Henry Phipps Institute for the Study, Treatment and Prevention of Tuberculosis, to the Presbyterian Home for Widows and Single Women, and to the Magdalene Home.

1880. Simes, J. Henry C., M.D., Emeritus Professor of Genito-Urinary and Venereal Diseases in the Philadelphia Polyclinic.

1903. Sinclair, John Falconer, M.D., Physician to the Medical Dispensary of the Presbyterian Hospital; Physician to the Philadelphia Orphan Asylum and to the Presbyterian Orphanage; Physician to the Home of the Merciful Saviour for Crippled Children.

1872. Sinkler, Wharton, M.D., Physician to the Orthopædic Hospital and Infirmary for Nervous Diseases; Neurologist to the State Asulum for the Chronic Insane of Pennsylvania.

1902. Siter, E. Hollingsworth, M.D., Instructor in Genito-urinary Diseases in the University of Pennsylvania; Genito-urinary Surgeon to the Philadelphia Hospital; Chief Surgeon to the Genito-urinary Dispensary of the University Hospital; Surgeon to the Dispensary of the Children's Hospital.

1904. Skillern, Penn Gaskill, M.D.

1895. Slocum, Harris A., M.D., Professor of Gynecology in the Philadelphia Polyclinic; Gynecologist to St. Clement's Hospital for Epileptics.

ELECTED

1904. Smith, Allen J., M.D., Professor of Pathology in the University of Pennsylvania; Pathologist to the University Hospital, to the Philadelphia Hospital and to the State Hospital for the Insane at Norristown, Pa.

1905. Smith, S. MacCuen, M.D., Professor of Otology in the Jefferson Medical College; Aurist and Laryngologist to the Germantown Hospital; Aurist to the Jewish Hospital.

1895. Spellissy, Joseph M., A.M., M.D., Surgeon to the Outpatient Department of the Pennsylvania Hospital; Visiting Surgeon to St. Joseph's and to the Methodist Episcopal Hospitals; Assistant Surgeon to the Orthopædic Department of the University Hospital.

1897. Spiller, William G., M.D., Associate Professor of Neurology and Professor of Neuropathology in the University of Pennsylvania; Clinical Professor of Nervous Diseases in the Woman's Medical College of Pennsylvania; Professor of Nervous Diseases in the Philadelphia Polyclinic and College for Graduates in Medicine.

1894. Stahl, B. Franklin, Ph.G., B.S., M.D., Instructor in Physical Diagnosis and Lecturer on Dietetics of the Sick in the University of Pennsylvania; Assistant Physician to the Philadelphia Hospital; Medical Director of St. Agnes's Hospital.

1904. Stanton, William B., M.D., Physician to the Department of Tuberculosis, Philadelphia Hospital; Physician to the Henry Phipps Institute; Visiting Physician to the Free Hospital for Poor Consumptives, White Haven, Pa.

1875. Starr, Louis, M.D.

1898. Steele, J. Dutton, M.D., Associate in Medicine in the University of Pennsylvania; Physician to the Medical Dispensary of the University Hospital; Bacteriologist to the Presbyterian Hospital.

1892. Steinbach, Lewis W., M.D., Professor of Clinical and Operative Surgery in the Philadelphia Polyclinic; Visiting Surgeon to the Philadelphia and to the Jewish Hospitals.

1884. Stelwagon, Henry W., M.D., Ph.D., Professor of Dermatology in the Jefferson Medical College; Dermatologist to the Philadelphia and to the Howard Hospitals; Associate Member of the Society of Dermatology and Syphilology of France and of Italy.

ELECTED

1895. Stengel, Alfred, M.D., Professor of Clinical Medicine in the University of Pennsylvania; Physician to the University, to the Pennsylvania and to the Philadelphia Hospitals.

1901. Stevens, Arthur A., M.D., Professor of Pathology in the Woman's Medical College of Pennsylvania; Lecturer on Physical Diagnosis in the University of Pennsylvania; Physician to the Episcopal and St. Agnes's Hospitals.

1902. Stewart, Francis T., M.D., Professor of Surgery in the Philadelphia Polyclinic and College for Graduates in Medicine; Surgeon to the Germantown Hospital; Assistant Surgeon to the Jefferson Medical College Hospital; Surgeon to the Out-patient Department of the Pennsylvania Hospital.

1898. Stout, George C., M.D., Professor of Otology in the Philadelphia Polyclinic and College for Graduates in Medicine; Laryngologist and Aurist to the Presbyterian Hospital, the Children's Aid Society, and to the William Penn Charter School.

1884. Stryker, Samuel S., M.D., Physician to the Presbyterian Hospital.

1900. Swan, John M., M.D.

1898. Sweet, William M., M.D., Professor of Diseases of the Eye in the Philadelphia Polyclinic; Demonstrator of Ophthalmology in the Jefferson Medical College; Assistant Ophthalmic Surgeon to the Jefferson Medical College Hospital and to the Philadelphia Hospital; Ophthalmologist to the Phœnixville Hospital.

1900. Talley, James Ely, A.B., M.D., Physician to the Out-patient Department of the Presbyterian Hospital; Assistant and Consulting Physician to the Country Branch of the Children's Hospital.

1901. Taylor, J. Gurney, M.D., Physician to the Pennsylvania Institution for the Instruction of the Blind.

1886. Taylor, John Madison, A.M. (Princeton), M.D., Editor *Monthly Cyclopædia of Practical Medicine;* Pediatric Physician to the Philadelphia Hospital; Assistant Physician to the Children's Hospital; Consulting Physician to the Elwyn, Pa., and to the Vineland, N. J., Training Schools for Feeble-minded Children.

ELECTED

1887. Taylor, William J., M.D., Surgeon to the Orthopædic Hospital and Infirmary for Nervous Diseases, and to St. Agnes's Hospital; Consulting Surgeon to the West Philadelphia Hospital for Women.

1886. Taylor, William L., M.D.

1867. Thomas, Charles Hermon, M.D.

1897. Thomson, A. G., M.D., Assistant Ophthalmic Surgeon to the University Hospital; Assistant Ophthalmologist to the Orthopædic Hospital and Infirmary for Nervous Diseases.

†1869. Thomson, William, M.D., Emeritus Professor of Ophthalmology in the Jefferson Medical College; Emeritus Surgeon to Wills Eye Hospital.

1896. Thorington, James, A.M., M.D., Professor of Diseases of the Eye in the Philadelphia Polyclinic; Member of the American Ophthalmological Society; Ophthalmologist to the Vineland and Elwyn Training Schools for Feeble-minded Children.

1898. Thornton, Edward Q., M.D., Assistant Professor of Materia Medica in the Jefferson Medical College.

1896. Toulmin, Harry, M.D., Assistant Medical Director of the Penn Mutual Life Insurance Company.

1901. Tucker, Henry, M.D.

†1894. Tunis, Joseph Price, M.D., Medical Examiner to the Equitable Life Assurance Society of the United States.

1901. Turner, John B., M.D., Clinical Assistant in the Ophthalmological Out-patient Department of the Jefferson Medical College Hospital.

1866. Tyson, James, A.M., M.D., Professor of Medicine in the University of Pennsylvania and Physician to the Hospital of the University of Pennsylvania; Physician to the Pennsylvania Hospital.

1897. Tyson, T. Mellor, M.D., Physician to the Philadelphia Hospital; Assistant Physician to the Hospital of the University of Pennsylvania; Physician to the Rush Hospital, to the Philadelphia Lying-in Charity Hospital and to the Children's Aid Society of Philadelphia.

1904. Uhle, Alexander A., M.D., Assistant Instructor in Genito-urinary Diseases in the University of Pennsylvania; Assistant

ELECTED

Surgeon to the Dispensary for Genito-urinary Diseases, University Hospital; Assistant Surgeon to the Dispensary of the German Hospital.

1873. Van Harlingen, Arthur, Ph.B. (Yale), M.D., Emeritus Professor of Diseases of the Skin in the Philadelphia Polyclinic; Dermatologist to the Children's Hospital.

1903. Van Pelt, William Turner, M.D., Ophthalmic Surgeon to the Episcopal Hospital.

1893. Vansant, Eugene Larue, M.D., Professor of Diseases of the Throat and Nose in the Philadelphia Polyclinic; Visiting Physician to the Throat, Nose and Ear Department of the Howard Hospital.

1897. Veasey, Clarence A., M.D., Adjunct Professor of Diseases of the Eye in the Philadelphia Polyclinic and College for Graduates in Medicine; Demonstrator of Ophthalmology in the Jefferson Medical College; Chief Clinical Assistant to the Ophthalmological Department of the Jefferson Medical College Hospital; Consulting Ophthalmologist to the Philadelphia Lying-in Charity Hospital.

†1883. Vinton, Charles Harrod, M.D.

1903. Wadsworth, William Scott, M.D.

1885. Walker, James B., M.D., Ph.D., Consulting Physician to the West Philadelphia Hospital for Women and Children.

1904. Walsh Joseph, A.M., M.D., Physician to the Henry Phipps Institute; Visiting Physician to the White Haven Sanatorium; Physician to the Department of Tuberculosis at the Philadelphia Hospital.

1893. Warren, Joseph W., M.D., Associate Professor of Physiology in Bryn Mawr College.

1895. Watson, Arthur W., M.D., Professor of Diseases of the Throat and Nose in the Philadelphia Polyclinic; Laryngologist to the Howard Hospital and to the Hospital for Diseases of the Lungs, Chestnut Hill.

1886. Watson, Edward W., M.D.

1903. Weber, Charles H., M.D., Physician to the Episcopal Hospital; Physician to the Dispensary of the Children's Hospital.

ELECTED

1883. Welch, William M., M.D., Physician-in-Charge of the Municipal Hospital for Contagious Diseases; Consulting Physician to the Northern Dispensary and to the Northern Home for Friendless Children.

1897. Wells, William H., M.D., Adjunct Professor of Obstetrics and Diseases of Infancy in Philadelphia Polyclinic; Demonstrator of Clinical Obstetrics in the Jefferson Medical College.

1893. Westcott, Thompson S., M.D., Associate in Diseases of Children in the University of Pennsylvania; Visiting Physician to the Methodist Episcopal Hospital; Assistant Physician to the Children's Hospital.

1884. Wharton, Henry R., M.D., Clinical Professor of Surgery in the Woman's Medical College of Pennsylvania; Surgeon to the Presbyterian and to the Children's Hospitals; Consulting Surgeon to the Bryn Mawr Hospital, to St. Christopher's Hospital for Children and to the Pennsylvania Institution for the Deaf and Dumb.

1901. White, Courtland Y., M.D., Assistant Director of the William Pepper Laboratory of Clinical Medicine; Lecturer on and Demonstrator of Gross Morbid Anatomy in the Veterinary Department of the University of Pennsylvania; Pathologist to the State Live Stock Sanitary Board, to the Children's, to the Jewish and to St. Joseph's Hospitals.

1878. White, J. William, M.D., Ph.D., John Rhea Barton Professor of Surgery in the University of Pennsylvania; Surgeon to the University Hospital; Fellow of the American Surgical Association and of the American Association of Genito-urinary Surgeons.

1905. Whiteway, Harold M., M.D.

1898. Whiting, Albert D., M.D., Surgeon to the Germantown Hospital; Assistant Surgeon to the German Hospital; Surgeon to the Southern Home for Destitute Children; Surgeon to the Out-patient Department of the German Hospital.

†1880. Willard, De Forest, A.M., M.D., Ph.D., Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the Germantown, to the Jewish, to the Atlantic City and to the Phœnixville Hospitals.

ELECTED

*1878. Williamson, Jesse, M.D., Wilmington, Delaware, one of the Surgeons to the Delaware Hospital.

1902. Willson, Robert N., Jr., M.D., Instructor in Physical Diagnosis, and Students' Physician in the University of Pennsylvania.

1881. Wilson, H. Augustus, M.D., Professor of Orthopedic Surgery in the Jefferson Medical College; Emeritus Professor of Orthopedic Surgery in the Philadelphia Polyclinic; Consulting Orthopedic Surgeon to the Philadelphia Lying-in Charity Hospital and to the Kensington Hospital for Women; Senior Orthopedic Surgeon to the Philadelphia Hospital.

1874. Wilson, James C., A.M. (Princeton), M.D., Professor of the Practice of Medicine and of Clinical Medicine in the Jefferson Medical College, and Physician to the Hospital of the same (Faculty Staff); Physician-in-Chief to the German Hospital; Attending Physician to the Pennsylvania Hospital.

1902. Wilson, Samuel M., M.D.

1897. Wilson, W. Reynolds, M.D., Visiting Physician to the Philadelphia Lying-in Charity Hospital.

1904. Wister, James W., M.D., Physician to the Out-patient Department of the Germantown Hospital.

*1901. Witmer, A. Ferree, M.D., New York.

1893. Wood, Alfred C., M.D., Assistant Professor of Surgery in the University of Pennsylvania; Assistant Surgeon to the University Hospital; Surgeon to the Philadelphia and to St. Timothy's Hospitals.

1900. Wood, George B., M.D., Instructor in Laryngology in the University of Pennsylvania; Assistant in the Clinic for Diseases of the Nose and Throat at the Polyclinic Hospital.

1865. Wood, Horatio C., M.D., LL.D. (Yale and Lafayette); Professor of Materia Medica and Therapeutics in the University of Pennsylvania; Associate Fellow in Medicine and Surgery of the American Academy of Arts and Sciences; Member of the National Academy of Science.

1903. Wood, Horatio C., Jr., M.D., Demonstrator of Pharmacodynamics in the University of Pennsylvania; Assistant Physician to the Philadelphia Hospital.

1880. Woodbury, Frank, M.D., Associate in Laryngology in the Philadelphia Polyclinic.

ELECTED

1866. Woods, D. F., M.D., Physician to the Presbyterian Hospital.

1901. Woods, Richard F., M.D., Assistant Surgeon to the Gynecean Hospital.

1888. Woodward, Charles E., M.D., Secretary of the West Chester Board of Health; U. S. Examining Surgeon; Member of the Medical Staff of the Chester County Hospital.

†1897. Woodward, George, M.D.

1903. Worden, Charles B., M.D., Associate in Diseases of the Stomach and Intestines in the Philadelphia Polyclinic; Physician to the Dispensary of the Presbyterian Hospital; Anæsthetizer to the Orthopedic Department of the University Hospital; Physician to the Presbyterian Orphanage.

1860. Wurts, Charles Stewart, M.D.

1889. Young, James K., M.D., Professor of Orthopedic Surgery in the Philadelphia Polyclinic; Clinical Professor of Orthopedic Surgery in the Woman's Medical College of Pennsylvania; Associate in Orthopedic Surgery in the University of Pennsylvania and Assistant Orthopedic Surgeon to the University Hospital.

1894. Zentmayer, William, M.D., Attending Surgeon to the Wills Eye Hospital; Ophthalmic Surgeon to St. Mary's Hospital; Ophthalmologist to the House of Refuge.

1899. Ziegler, S. Lewis, M.D., Attending Surgeon to the Wills Eye Hospital; Ophthalmic Surgeon to St. Joseph's Hospital; Membre Société Française d'Ophtalmologie.

1887. Ziegler, Walter M. L., A.M., M.D.

1895. Zimmerman, Mason W., M.D., Ophthalmic Surgeon to the Germantown Hospital.

ASSOCIATE FELLOWS.

[Limited to Fifty, of whom Twenty may be Foreigners.]

American.

ELECTED

1876. Billings, John S., M.D., U. S. A. (retired), New York.
1886. Bowditch, Henry P., M.D., Boston, Massachusetts.
1877. Chaille, Stanford E., M.D., New Orleans, Louisiana.
1886. Cheever, David W., M.D., Boston, Massachusetts.
1896. Conner, Phineas Sanborn, M.D., Cincinnati, Ohio.
1893. Councilman, William T., M.D., Boston, Massachusetts.
1876. Davis, N. S., M.D., Chicago, Illinois.
1892. Emmet, Thomas Addis, M.D., New York.
1892. Fitz, Reginald H., M.D., Boston, Massachusetts.
1895. Fletcher, Robert, M.D., Washington, D. C.
1903. Gorgas, William C., M.D., U. S. A., Washington, D. C.
1891. Jacobi, A., M.D., New York.
1895. McBurney, Charles, M.D., New York.
1886. Reeve, John C., M.D., LL.D., Dayton, Ohio.
1886. Senn, Nicholas, M.D., Chicago, Illinois.
1896. Sternberg, George M., M.D., U. S. A., Washington, D. C.
1896. Tiffany, L. McLane, M.D., Baltimore, Maryland.
1894. Warren, J. Collins, M.D., Boston, Massachusetts.
1894. Weir, Robert F., M.D., New York.
1892. Welch, William H., M.D., Baltimore, Maryland.

Foreign.

1890. Baccelli, Guido, Rome, Italy.
1877. Barnes, Robert, M.D., London, England.
1894. Brunton, Sir T. Lauder, M.D., London, England.
1883. Fayrer, Sir Joseph, M.D., LL.D., F.R.S., London, England.

ELECTED

1903. Finlay, Charles J., M.D., Havana, Cuba.
1899. Fraser, Thomas R., M.D., LL.D., F.R.C.P., F.R.S., Edinburgh, Scotland.
1903. Horsley, Sir Victor Alexander Haden, F.R.S., London, England.
1896. Jaccoud, Prof. S., M.D., Paris, France.
1874. Jackson, J. Hughlings, M.D., London, England.
1893. von Jaksch, Rudolf, M.D., Prague, Bohemia.
1903. Kocher, Prof. Theodor, M.D., Berne, Switzerland.
1896. Leyden, Ernst, M.D., Berlin, Germany.
1877. Lord Lister, M.D., LL.D., F.R.S., London, England.
1896. Pye-Smith, P. H., M.D., London, England.
1898. Roddick, Thomas G., M.D., Montreal, Canada.
1869. Valcourt, Th. de, M.D., Cannes, France.
1904. Waldeyer, Prof. Wilhelm, M.D., Berlin, Germany.

CORRESPONDING MEMBERS.

1880. Carrow, Flemming, M.D., United States.
1880. Chiara, Domenico, M.D., Florence, Italy.
1886. Dey, Kanny Lall, M.D., Calcutta, India.
1885. Rendu, Jean, M.D., Lyons, France.

NECROLOGICAL LIST.

FELLOWS.

DAVID D. STEWART,	June 13, 1905.
ROBERT P. ROBINS (N.R.),	August 13, 1905.
GEORGE R. MOREHOUSE,	November 12, 1905.

ASSOCIATE FELLOWS.

JOHANN VON MIKULICZ-RADECKI,	June 17, 1905.
JOHN W. OGLE,	August 8, 1905.
CHRISTOPHER HEATH,	August 8, 1905.

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MEMOIR OF DR. F. SAVARY PEARCE.[1]

By J. M. ANDERS, M.D., LL.D.

The writer in attempting to portray the details of the life of his lamented colleague labored under the disadvantage of not having had the privilege of enjoying his friendship for more than about five years. During Dr. Pearce's college course, the writer had not the pleasure of his acquaintance, hence reminiscences of that interesting period in every physician's life cannot be given. From the commencement of an acquaintance, which ripened and strengthened, until his untimely demise, the writer was deeply impressed by his high moral qualities, singular sincerity, and uprightness in respect to every relation of life, and his devotion to friends and members of his own family, especially to his mother, which was entire and may be reckoned as one of the chiefest tests of character.

Dr. F. Savary Pearce was born in Steubenville, Ohio, on October 14, 1867, and came into the medical profession, as it were, by inheritance. His father, a well-known physician of the same city, was a surgeon in the Civil War, Seventy-first Ohio Volunteers, rising to the rank of Senior Surgeon (equivalent to that of Captain) of his regiment, and he was graduated from Jefferson Medical College in 1854. His mother, whose decided fondness for, and conscientious devotion to, the subject of this memoir was deep and beautiful, died thirteen days after the summons came to her son, of a broken heart, as if an existence without him was not possible for her. Dr. Pearce was a direct descendant of Franklin Pierce.

[1] Read January 4, 1905.

President of the United States, and also of Thomas Savary, a prominent Friend of Philadelphia in Revolutionary times.

He was graduated from the Steubenville High School June 18, 1886, and from Duff's Mercantile College, in Pittsburgh, June 14, 1887. In the same year he successfully passed the examination for entrance to the United States Naval Academy, at Annapolis, Md. Preferring a medical to a naval career, which was distasteful to him, he resigned as cadet midshipman, before entering service, in order to study medicine at the University of Pennsylvania, from which institution he was graduated in 1891 with honors. While an under-graduate, he was president of the D. Hayes Agnew Surgical Society, session of 1890–91.

After taking his degree, Dr. Pearce achieved distinction in receiving first appointment, through a competitive examination, as resident physician to the Presbyterian Hospital of Philadelphia. Upon the completion of his term of service in this institution, he was elected to a similar post at the Orthopædic Hospital and Infirmary for Nervous Diseases of Philadelphia. As an interne, Dr. Pearce had already shown remarkable industry and a sterling integrity that made him trusted by his fellows.

Commencing in June, 1893, he was assistant to his father, Dr. E. Pearce, in Steubenville, Ohio, until the autumn of the same year, when he left the city in which he had been reared and had received his early education, his family, friends, and patients, returning to, and settling in, Philadelphia for general medical practice. Dr. Pearce, however, early manifested a natural inclination to the study of nervous diseases, and this bend of mind determined the choice of the specialty which he pursued with untiring zeal until the day of his death.

He worked for some time in the service of Dr. S. Weir Mitchell at the Orthopædic Hospital, under whose influence young Pearce caught the inspiration which revealed itself in the enthusiasm and ability shown by him as a specialist in the domain of neurology. Dr. Pearce was quiz master in Pathology (first year) and Physical Diagnosis and Symptomatology (second year) in the Philadelphia Medical Institute from 1891 to 1893. Commencing with the

session of 1896–97, he was appointed Instructor in Physical Diagnosis in the Medical Department of the University of Pennsylvania; this position he held until 1900, when he resigned.

In 1901, he received the appointment of Clinical Professor of Nervous Diseases at the Medico-Chirurgical College, Philadelphia, and two years later he was elected to the chair of Nervous and Mental Diseases in the Faculty of the Medico-Chirurgical College. At the time of his death, he also held the position of neurologist to the Medico-Chirurgical, Philadelphia, and Howard Hospitals.

He was the product of heredity and a salubrious domestic environment which enabled him early in life to do right, to conform with truth and fact. It is said that as a child he was of an amiable disposition, which later developed into great consideration for others; he was a leader in boyish sports and a fine student, excelling in mathematics. It is said by those who were his associates during college days that he rarely laughed aloud, and this was even more true of the last years of his life, but his appreciation of the humorous was nevertheless normally keen. He was a lover of athletic sports and he entered the foot-ball field as a spectator with enthusiasm. Dr. Pearce was often referred to as a handsome man, and his features, which were regular and clean-cut, bore the stamp of true refinement. He had the gentleness of a child and much sympathy which constantly manifested itself in kindly service. He was decidedly inclusive in his affections and friendships, thus proving the largeness of his nature. It should, however, be said in justice that he did not have any specially conspicuous social proclivities.

He was quite free from envy and ready at all times to acknowledge the excellencies of his friends and contemporaries. He rejoiced even more in the triumphs of others than in his own. He never shrank from the duties imposed by any position because it compelled serious work; on the other hand, he welcomed work and no personal effort was considered too great or too strenuous if thereby he could promote worthy objects or aid in providing a better heritage for the future. He recognized few if any persons as enemies, and thoughts and acts of hatred coming from others

were generally met by acts of love and kindness. He "set his face toward right and goodness" under all circumstances, and ignoble wrangles he contended brought neither profit nor comfort to the heart.

Without any intention to imply a reproach to him, since he frankly expressed himself to the same effect, Dr. Pearce's early mental training was somewhat limited. This deficiency in early education he sought diligently to rectify in later years so as to give greater scope to individuality of character, and it was probably the cause of his frequent literary excursions into fields other than medicine. Dr. Pearce made himself a man of many and varied attainments. Moreover, his medical education was both thorough and complete, and he distinguished himself in his classes.

As a colleague, Dr. Pearce was *facile princeps* in many respects, more particularly as to his absolute fairness of speech and action, his modesty, genial, kindly spirit and high sense of honor. He was a popular teacher, enjoying the favor, confidence, and regard of the students to a remarkable degree. His delivery was neither vigorous, eloquent, nor fluent; *per contra*, it was soft and gentle, affecting, however, the senses of his auditors pleasantly. The casual listener to his clinical and didactic lectures would be inclined to view them as feeble efforts, but they were practical in character, deeply instructive and highly valued. A strong bond of union was early established between himself and the student, and few teachers of medicine enjoyed to an equal degree the love and respect of the undergraduates. He was among the foremost in his advocacy of progressive measures, and the means that tended to improve medical teaching as well as to promote the growth in other spheres of usefulness of the institution with which he was connected.

Dr. Pearce was a member of an unusually large number of medical organizations, among which were the Philadelphia County Medical Society, the Pennsylvania State Medical Society, the American Medical Association, the College of Physicians of Philadelphia, the Neurological and Pathological Societies of

Philadelphia, the American Climatological Association, the Historical Society of Pennsylvania, and the Medical Club of Philadelphia. In most of these bodies he was quite active, making frequent contributions to the proceedings, more especially of the Neurological and Philadelphia County Medical Societies, the American Climatological Association, the College of Physicians, and to those of the Section on Neurology of the American Medical Association. Dr. Pearce had been Secretary of the Section on Neurology of the American Medical Association, and at the time of his death was its chairman. For several years immediately preceding his decease he was Treasurer of the Philadelphia Medical Club.

The complete list of the known extant publications from his busy pen bear striking testimony to his overzealous enthusiasm and excessive application to his chosen field of work. An examination of the literature by the writer revealed that he was the author of not less than twenty articles in the course of five years, a few of which entailed rather extensive laboratory studies and investigations.

It would seem almost incredible that so prolific a medical writer should also find time during this same interval, in connection with his professorial and professional duties, to prepare a text-book, but shortly before his unseasonable death occurred, he issued a *Practical Treatise on Nervous Diseases, for the Medical Student and General Practitioner*, a work whose reception, owing to his passing away so soon after it appeared, has not been in accordance with its desserts. But though he had both appetite and aptitude for the acquisition of practical and scientific knowledge appertaining to his profession, he heeded always the finer qualities of the Creator's handiworks. Moreover, Dr. Pearce did not combine his intense zeal with rigid adherence to neurological subjects, but both poetry and romance occupied a considerable portion of his mind. It is an authenticated fact that his last literary effort was a novel which, however, until the present remains unpublished. Dr. Pearce possessed the poetic passion to an unusual extent and to him Nature often told her story in song. As a poet, however,

he failed to attain to his complete ideal, although some of his verses have both beauty and a distinct touch of pathos.

The personal side of Dr. Pearce was conspicuous and his deserved popularity was due partly to an agreeable manner, but principally to his loving nature and gentleness and kindliness of heart. His personality was attractive and even to persons including physicians who had not the privilege of an intimate acquaintance with him, but met him occasionally by chance.

While Dr. Pearce was ambitious for professional honors, moral enthusiasm and constancy dominated his thoughts and actions and formed the essential part of the man. Without wishing to overestimate his moral splendor and worth, it may be justly claimed that these attributes removed him from the category of mere clever physicians to a field of honest effort, courage and independence that is without ulterior purpose.

He was not of a "practical" turn of mind, his standard was not a commercial one, but he aimed to bring himself into harmony with all that is truest and best in the universe and he was most receptive to the higher and better influences. On the other hand, although confident, he was scarcely sufficiently cheerful in disposition to attract all of the elements of success. Dr. Pearce was given to worry; he took life too seriously. Had he been more hopeful and tranquil he would have been correspondingly more robust and vigorous. We see in his case an illustration of the violation of psychologic law and deleterious effects upon bodily health and vigor—an unmistakable evidence that those who incur an impaired constitution as the result of an abuse of the mental faculties, no less than from sexual excesses, must suffer premature physical bankruptcy.

His fund of vitality was meagre; yet he worked all of the day and almost regularly far into the night. Dr. Pearce responded to the call of the well-to-do and the pauper with equal readiness. Neither did he bestow less or more attention upon the one than upon the other. He manifested a ready confidence in the interests and sympathy of his patients, colleagues, and friends

During the summer weeks, Dr. Pearce indulged at times in brief periods of rest and recreation, but rarely took a vacation that seemed adequate to benefit his health or to fortify his overworked nervous system. His brief years were spent in work. Had he slackened his pace before the final collapse came, his life would have been spared for many years to come. Shortly before his last illness he was much exhausted by the arduous labors of the previous winter, and upon the earnest solicitation of the writer agreed to take a trip to Europe, but failed to avail himself of this means of relief until the opportunity had passed forever.

Dr. Pearce was devoutly religious. His was no imaginative faith, not a process of reasoning, but a vivid experience. Although a member of the Episcopalian Church, and for several years a regular attendant upon religious services, forms of Christian faith or sectarian creeds did not delimit his feelings. To him Christian living connoted love and charity to all; by him the sacred books of no cult were despised. Not a few of the leading laymen and members of the clergy were among his ardent admirers; they recognized in him those traits of character which in their belief should grace every medical career.

Of his last illness I can say but little, having seen him only once for a period not exceeding five minutes' duration after his case presented urgent symptoms. During that brief interview, which took place in my office, the indications of an active delirium were sadly enough only too evident, and efforts to calm mental excitement proved to be unavailing. This occurred at four o'clock in the afternoon; he left my door, stating as he did so that many things were awaiting his immediate attention. It was my misfortune on that day to have previously arranged for a consultation some distance from the city. Upon my return to Philadelphia, at nine o'clock, I went directly to his home, my object being to render appropriate service, but he had taken his departure one hour before my arrival, saying to a servant that he was "bound for St. Louis." Upon investigation this was found to be true, but a telegram sent to his family led to his being intercepted en route and taken to his home in Steubenville, Ohio.

I have recently received trustworthy information to the effect that his temperature was about 101° on arrival there, and that it subsequently rose higher day by day and immediately preceding death it reached 104°. Dr. A. M. Blackburn, who was the medical attendant, in response to a written request for data pertaining to Dr. Pearce's last illness, stated that when first called, on May 19th, he found his patient suffering from "great nervous excitement and partial delirium;" he also complained of pain in the head, the skin was warm but moist, and pulse 100 per minute. On the evening of the same day, as the result of hyoscin hydrobromate, gr. $\frac{1}{100}$, repeated hourly for three doses, he became quiet. On the following morning, delirium and mental excitement soon became even worse than on the day previously. Throughout the entire attack the periods of excitement were followed even when hypnotics were not employed by a semicomatose condition, from which he would arouse to the wildest delirium. This condition persisted, growing worse, however, each day, the coma at times being profound, until the evening of May 27th, when he ceased to breathe.

In view of the symptoms and course, it may be safely assumed that the cause of death was some form of toxæmia.

It is truly sad to reflect that his reputation as a neurologist, gained at the expense of much toil and weariness, was destroyed by the seeming ungenerous hand of death just as vigorous manhood was passing into maturity of thought and judgment, and the long period of waiting and of working in the difficult domain of neurology was being rewarded with practical success.

With the physical collapse and ruin that ended so sadly, his chances and opportunities were lost forever. May we not hope and believe that in view of this sad event his personality may assume even greater significance to the medical profession than if he had been spared long enough to have enjoyed greater recognition and higher rewards and honors such as usually come to men of mark at a more advanced period of life. Compared with the failure to attain the position to which he would have risen had he been permitted to live, may not his life be accounted a success

when we recall how he turned to account every opportunity in a way to maintain the honor and dignity of the profession which he adorned? His life should prove of inestimable value to the younger men of this and future generations as a pattern of many virtues on the one hand, and freedom from the commoner vices of his sex on the other. Although he departed this life prematurely, he left the memory of a spotless name, a high character, and a of life full of benevolences, for the contemplation of all. To those who knew him intimately, the sense of his loss is great, and the memory of his sweetness of soul, lasting.

ANNUAL ADDRESS OF THE PRESIDENT.[1]

By ARTHUR V. MEIGS, M.D.

The principal difficulty I have encountered in the endeavor to prepare the annual address, which it is my duty as your President to deliver at this meeting, has been to select from the many topics that come before my mind those in regard to which it is most necessary that you should be informed. Your President can comprehend the systems and the operation of the various departments of the College as no one else can, for the By-laws provide that "he shall be notified of the times of meeting of all standing committees and have a right to attend the same." I have availed myself to some extent of this privilege. The work of the various officers and committees is very extensive, and I think the College has reason to be proud of the manner in which it is accomplished.

The Library Committee has charge of the largest department of the College and its work involves a greater pecuniary outlay than that of any other one. The organization required to manage so large a library is necessarily complex, but the system by which this is accomplished has been a gradual growth. Some years ago the Library was small and it was kept open only a few hours at a time. The Librarian was an elderly, scientific physician who did not practise, and who did all the work connected with the care of the books and the cataloguing, as well as the administration. Our present Librarian has been in service a good many years. When he first came to the College he did, under the direction of the committee and of the Honorary Librarian, all of the work of the library, but as it has grown he has been accorded more and more help,

[1] Read February 1, 1905.

until now there is quite a number of assistants. All of this complex organization has been built up under the direction of the Fellows who have been, and by those who now are, members of the Library Committee and by the Honorary Librarians, with the efficient aid of the Librarian.

The Committee of the Directory for Nurses is one of whose organization most of the Fellows probably do not know very much. Some of us have had occasion to complain, when it has happened, that one of our patients has engaged an unsatisfactory nurse, but we have not always stopped to think, as we should have done, how many good nurses we have obtained and what an advantage it is to the community and to physicians to be able to find nurses so surely and so speedily as can be done through the Directory. A few years ago it was often necessary to spend a long time and to travel many miles over the city before a nurse could be secured. The organization of the Directory is thoroughly systematized, and great effort is made to deal justly by everyone who has transactions with it. I wish that every Fellow of the College could see the manner in which the monthly meetings of the committee are attended by all three of the members, and how the work is divided, so as to obtain the greatest efficiency of action with the least loss of time in the transaction of the large amount of business that comes before the committee.

There is a matter connected with the administration of the Museum which I think should receive the attention of the committee. In the articles of agreement between the late Dr. Mütter and the College, it is provided that there shall be appointed annually "a Curator of the Mütter Museum, who is also to be Curator of the College," and, further, it is provided that "the Museum of the College of Physicians shall be annexed to the Mütter Museum." These two provisions seem to me clearly to imply that the Museum of the College, which must have existed at the time that the Mütter collection was given to the College, was to continue to exist, but to be annexed to the Mütter Museum. The committee, I think, would do well to take legal advice, and if it is not prohibited by our contract with Dr. Mütter (and it seems

to me clear that it is not) there should be placed over the door of the Museum a placard setting forth that it is the Mütter Museum and the Museum of the College of Physicians of Philadelphia. Hereafter a careful distinction should be made that there are two annexed museums, and all specimens presented without conditions should be recorded as belonging to the Museum of the College. This would retain to the College the right to allow objects that belong to its museum to be removed from the building if it should ever be desirable, which is forbidden regarding specimens belonging to the Mütter Museum. The clear distinction of the two museums from one another would also enable the College hereafter to know definitely what property was its own and what was subject to the provisions of the agreement with Dr. Mütter.

The annual publication of the volume of Transactions of the College is of a degree of importance which is not generally appreciated. These volumes, although not large, are of great use to our institution. They contain its history, and in them will be found many essays of scientific value which reflect credit upon our Fellows. In the different volumes there are reports of discussions of various questions which show curious changes of public sentiment, and these constitute a valuable chronicle of the times regarding medical subjects. The Committee of Publication had to issue the annual volume without paying anything to the editor for his labor until within a year or two, when $5000 was generously left to the College by the late Dr. J. M. Da Costa, with the request that the amount be used as the nucleus for the formation of a publication fund. It was at times very difficult for the committee to find anyone willing to undertake the onerous duties of editor, and the amount of his compensation is now very small. It is probably not known to all of the Fellows that a large number of the copies of the Transactions printed each year are sent out to other societies and periodicals in the form of what is called exchanges, which means that books and periodicals are received in return, which are placed in the Library. In this manner quite a considerable proportion of the money expended each year by the Publication Committee is indirectly used for the acquisition of books for the Library.

It is certain that the money spent upon the Transactions is profitably used, for the greatest of the learned societies are best known to the rest of the world by the reputation earned by their published transactions. It is my own belief that the College would do well to be more liberal in its expenditure upon its annual volume of Transactions, even if for a time a little less were given to the Library. Perhaps at some time the Fellows may deem it wise to consider this question and to try to find some way in which the usefulness of the Transactions, which is now very great, can be increased.

It is impossible, I am sure, that all of the Fellows can be aware of the admirable order in which our accounts and archives are kept by our Treasurer and Secretary. In both of these departments systems have been gradually evolved by former officers which are continued in operation and have been improved by the present incumbents, so that our records are now all so arranged that it is easy to obtain any information from them that may be desired.

Nine of the members have died during the year.

Dr. Samuel B. Howell was elected a Fellow in 1868. He was a man of very considerable scientific attainments and was Professor of Chemistry in the Medico-Chirurgical College. He died December 12, 1903.

Dr. William H. Webb was elected a Fellow in 1875, and was a respected practitioner. He died December 20, 1903.

Dr. Washington H. Baker was elected a Fellow in 1879. Dr. Baker was a practitioner of medicine and attained a reputation as an obstetrician and gynecologist. He died April 1, 1904.

Dr. William Barton Hopkins was elected a Fellow in 1879. He was Surgeon to the Pennsylvania Hospital. The Censors have directed that a memoir of his life shall be prepared, and that history in due time will be laid before you. He died May 4, 1904.

Dr. Roberts Bartholow was elected a Fellow in 1880. You have already heard the admirable memoir of him which was read by his colleague, Dr. Holland, and it will be printed in the Transactions. Professor Bartholow died May 10, 1904.

Dr. Thomas M. Drysdale was elected a Fellow in 1884. Dr. Drysdale had for many years a large practice, and he attained considerable reputation as a surgeon. At a time when it was not generally popular, he became an earnest advocate of ovariotomy and performed the operation many times, and successfully. He died May 26, 1904.

Dr. F. Savary Pearce was elected a Fellow in 1896. A memoir of him will be read to you in due time, and, therefore, it is not necessary for me to say more than that he was Clinical Professor of Nervous Diseases in the Medico-Chirurgical College. Dr. Pearce died May 27, 1904.

Dr. George M. Stiles was elected a Fellow in 1898. He was a practitioner of medicine of considerable repute in Conshohocken. He died June 9, 1904.

Dr. Auguste F. Müller was elected a Fellow in 1890. He came to this country from Germany when he was quite young, and, overcoming many difficulties, became a practitioner of medicine and a surgeon of the best reputation in Germantown. He was one of the attending surgeons to the Germantown Hospital. Dr. Müller died October 20, 1904.

The College has lost by death during the past year more than the ordinary proportion of its members. I have indicated briefly what manner of men our deceased Fellows were, but I cannot pass from the subject without trying to emphasize the lesson our loss would seem to teach. Each one of these members had attained such success in his chosen walk of life as to prove them all to have been superior to the average of men. Of such material is composed the membership of the College of Physicians of Philadelphia. It is a scientific society of physicians carefully selected from the best in the city and neighborhood. The Fellowship is sought for, and the College, which is of unique character, is respected and prosperous.

The acquisition of a large sum of money for the improvement of the Library has brought the College to the consideration of the question of removing to some new site or of making a radical change in our building. This question has not yet been settled,

and it is one of great difficulty for the College to decide. Immediate action has proved impossible, but there ought not to be unnecessary delay, for so long as the question is pending the dignified calm that is essential to the study of questions of public interest or to the pursuit of scientific research is impossible at our meetings, besides which delay is likely to prove expensive. When a business question is pending and is absorbing the energies of the members, it is impossible properly to discuss a scientific problem. Injury to our proceedings must inevitably result. There had been arranged for this very evening a discussion of a subject that is absorbing much attention among intelligent physicians, but it has been withdrawn—permanently, I fear—because we must deal with a business proposition that is likely to demand much time.

Nearly two years ago the College hastily decided to buy an unimproved lot of ground that yields only income enough to pay the taxes. Since the purchase was made it was once resolved to remove to the new location, and subsequently it has twice been resolved not to remove to that site, but to sell the lot. Unless there should be another change of opinion, it is almost certain that a large amount of money will be lost in consequence of the hasty purchase that was made; for even if the lot should eventually sell for as much as was paid for it, which at present seems unlikely, there will remain the loss of interest upon $80,000, that sum having been paid for the property, which will amount to at least $6000 or $8000.

I know that many of you have been grieved and vexed at the indecision manifested during the last two years, and in this you have my heartfelt sympathy, but it is necessary to recollect that precipitate action is often worse than delay. Too great deliberation is undoubtedly bad; on the other hand, it has been proved in our own case that undue haste is worse, for it has been the cause of indefinite delay. I have myself believed, and I still hold to the opinion, that men of the intelligence of our members will finally reach the right solution. This, I think, can only be done by the consideration of the different propositions brought forward, and

by rejecting one by one those that do not meet with the approval of the majority, in the hope that finally something will appear that will receive the endorsement of a sufficiently large number of the Fellows to make it operative. Let me beg you in the mean time to recollect our heritage of conservatism and to do nothing hastily.

In conclusion, permit me to congratulate you upon your prosperity and on the distinction of the College.

RECENT ADVANCES IN THE TECHNIQUE OF ROENTGEN RAY THERAPY.[1]

By CHARLES LESTER LEONARD, A.M., M.D.

The great variance in the results reported in the treatment of disease by the Roentgen method must strike the reader of medical literature very forcibly, and lead him to wonder if there is any truth in the favorable reports or any logical explanation for the diversified and often apparently antagonistic physiological effects.

This feeling of doubt is readily enforced if he has chanced to come in clinical contact with the results of an inexperienced operator. It must, however, be remembered that positive evidence is always more valuable than negative. That even a few accurate observations of beneficial results attained are far weightier evidence of therapeutic efficiency than any number of failures. The time has not yet arrived when cures can be demonstrated, a longer period of therapeutic employment is necessary, though many cases have remained apparently cured for over two years. An inhibitory action has, however, been absolutely demonstrated. The power to inhibit the growth of malignant or other pathological cells has been demonstrated beyond any question. This agent has been proved to be more potent than any other agent heretofore employed in checking the growth of malignant cells. Even operation, which is as yet the most effective method of treatment, does not inhibit the growth of the disease; it eradicates it by removing it from the body, but in no way alters the nature or character of the cellular growth. Operation is not curative except by being destructive. The Roentgen ray has been demonstrated to have inhibitory power over the cellular malignant activity of new-growths; it is reconstructive rather than destructive.

[1] Read February 1, 1905.

While the failures to secure permanent results far outnumber the successes, they do not outweigh them. The Roentgen method has been too frequently asked to accomplish results that were impossible by other means, and hopeless cases have been the rule rather than the exception. When it has had the opportunity to co-operate in treating cases after surgical removal of the focus of malignant disease, the results obtained in the treatment of these conditions will be improved. Roentgen treatment should supplement but never supplant operation, where operation is admissible. But to attain the highest degree of success, cases must be sent early for Roentgen treatment, as well as early for operative intervention.

The apparent variation in the effect of the Roentgen rays on disease is to be explained by differences in the technique employed by operators, and by inefficient employment resulting from inexperience and often timidity which it breeds.

The prevailing idea that this method of treatment is successful in and can only hope to influence superficial malignant growths is erroneous. The rarity of cases in which it has affected deep-seated growths has been due to a lack of knowledge of the qualities of Roentgen rays suitable for their treatment and defective technique and experience in employing them. There are enough authenticated cases to demonstrate its power, and recent advances in the knowledge of technique have placed them more readily under the influence of this agent.

The facts already demonstrated make it the most potent alterative and curative agent known for the treatment of malignant disease. They make it imperative that every conscientious practitioner should carefully consider the employment of this agent as a supplementary method to surgical operation in the treatment of every case of malignant disease that comes under his care. The mortality from malignant disease even after early radical surgical removal is so great that so powerful a supplementary method of treatment ought not to be neglected.

A review of the probable physiological action and pathological changes that follow its employment will in a measure explain the rationale of its wide field of application and harmonize its apparently antagonistic effects. A study of the principles that

underlie its application will help to a realization of the difficulties that must be mastered by technique before accuracy and efficiency in dosage can be expected. The variation in results can then be more readily understood and can be shown to follow defective technique and not to be due to the valuelessness of the agent. It will be easy to appreciate why results can be obtained by those possessing technique and experience, while others fail even to improve similar cases.

A reasonable deduction regarding the physiological action of this agent can be gained from the clinical observation of its effects. Stimulation of nutrition, both local and systemic, has been almost universally observed where physiological effects have been produced. Changes due to altered metabolism are seen in all cases, and pathological examinations have repeatedly demonstrated varying degrees of retrograde metamorphosis in tumors that have been effectively treated. This stimulant action when pushed produces decided alterative effects, which have been ascribed to the autolytic ferments within the cells and results finally in their dissolution and absorption. The effect of these forces fortunately is varied in its action on normal and pathological cells, a result not uncommon to stimuli. The stimulus which will injure pathological cells has no harmful effect upon normal metabolism, but rather increases the vitality and growth of normal tissues. This hypothesis readily explains the selective action of the Roentgen treatment and shows why effective dosage is difficult, since it must be strong enough to injure pathological cells and yet not too strong for normal tissues. Fortunately in practice the reaction of the skin forms a valuable clinical guide.

The clinically demonstrated physiological action of this agent, whatever it really is, is at least unique, since it possesses the power of inhibiting the growth of malignant cells, possibly of destroying them. No other agent has ever demonstrated such power over the morbidity or the cellular energy of growth of malignant tumors. No other agent has possessed the selective power to destroy malignant cells without injuring the normal surrounding structures. The only effective method of treatment has been the removal of the diseased tissue with the surrounding normal structure or their total destruction *in situ* by cauterants. The great difference between

this and all other agents employed in treating malignant disease is that it differentiates between pathological and normal tissues, retarding and preventing the development of pathological cellular activity while it does not harm or hinder the growth of normal cells.

The latest views regarding malignant growths attribute their malignant character to an inherent and unexplained increase in the energy of growth of their cells, which experimental studies (Loeb) have shown is in marked contrast to that of the cells of normal tissues or of benign tumors.

This energy varies in intensity in different tumors, but is constant for each tumor even through a long series of transplantations. Further, it has apparently been demonstrated that the formation of metastases is caused and can occur only where there is a primary increase in the energy of growth of the tumor cells.

These pathological facts harmonize with the physiological action attributed to the Roentgen energy. In their light the rationale and value of preparatory or tentative Roentgen treatment before operation and of postoperative treatment can be seen. The peculiar primary energy of growth of malignant cells is reduced by the inhibitory action of the rays. The growth not only of the original tumor, but also of metastases and wandering malignant cells, is checked.

It is generally conceded that an irritating or exciting cause is an essential to the development of malignant growths, and that often incomplete operations act as exciting causes and increases the morbidity of the growth. Preparatory and postoperative treatment are, therefore, valuable because they inhibit the energy of malignant cells, if they do not destroy them, and render metastasis less liable, while the supplementary treatment destroys any remaining cells or inhibits their growth.

Can it be possible that in these pathological findings and physiological action an explanation is found for the production of malignant growths in the hands of Roentgen operators. Such cases have unfortunately been reported, and in them the disease originated simultaneously in both hands. Possibly the continued though feeble stimulation of normal cells resulted in a permanent increase in the energy of growth, whereby they took on the char-

acteristics of malignant cells and acquired the power to grow and multiply at the expense of surrounding normal tissues and to form metastases.

An analogous process as diametrically opposed as is the destruction and production of malignant disease is seen in the clinical effects in hirsuties and alopecia areata, where overstimulation destroys the hair and mild stimulation causes an increased metabolism in the hair follicles and a renewed growth of hair.

But what are the difficulties that underly the accurate application and dosage of this agent? Why have the results been so varied and antagonistic? Why should they be better? And what is essential to its efficient and successful application?

The chief difficulties that underly the accurate application and dosage of this therapeutic agent lie in its method of production and the variation in its qualities that must be recognized and applied accurately to be effective. The complicated physical apparatus employed in its production must be thoroughly understood and special knowledge and technique acquired to produce and recognize the various qualities of this therapeutic force. In addition clinical experience and knowledge are essential to an appreciation of their effects and the adaptation of the particular quality of energy to the lesion which it most readily affects.

Improvements in apparatus for the production and measurement of the amount of energy that is developed make these difficulties less great and the acquirement of technique easier, but there will always remain the problems common to the employment of all remedies in clinical work. As has been aptly said of this agent, it must be applied in the proper strength, dose, and frequency. The most specific drugs known, quinine and mercury, cannot be successfully applied without accurate diagnosis and the help of clinical experience.

With the necessity of developing special technique to produce this therapeutic agent accurately, and again clinical technique and experience in employing it, is it to be wondered at that results have been often disheartening to those who have expected any quality and any dose to accomplish results? When in addition it is remembered that the majority of cases treated, especially of malignant disease, have been hopelessly inoperable, is it not a

proof of the inherent value of this agent that any successes have been recorded?

The recognition of the necessity of adapting the quality and dose of this agent to each individual lesion and patient, and a clearer knowledge of which quality and technique is applicable to each group of cases, afford the prospect of greater developments and of more frequent successes in the future.

Efficient Roentgen therapy is not the result of chance, nor can it be purchased with the apparatus. The wonderful results that have been produced, though they may not be always repeated, were not the result of good fortune or accident. They have followed diligent, untiring study of the phenomena observed in the Roentgen tube and their clinical effects upon disease. The necessity for special education of the clinician who would apply this agent effectively is self-evident. The knowledge of how to produce the required quality of Roentgen discharge must be combined with the knowledge of when to apply it and clinical experience must be capable of measuring the exact dose. No therapeutic agent can be effective without the fulfilment of these requirements, and there is little wonder that without them more failures than successes have been recorded.

Such a powerful therapeutic agent is dangerous or useless in the hands of anyone less well qualified. It is dangerous if he employ it in a dose capable of doing good and is incapable of accurately observing its effects; and it is useless and even harmful if inexperience makes him timid in its employment, or ignorance leads him to employ a dose that will stimulate instead of injure pathological tissues.

But are not the poor results in deep-seated disease due to the limitations of this therapeutic agent, or why is it that so many can produce effects upon superficial lesions and cannot influence the deep seated? There was a similar condition in the field of diagnosis; at first lesions of bone in fingers, hands, and toes only could be diagnosed; as technique improved all parts of the body have been penetrated and the various tissues have finally yielded to a differentiation in their shadows. Those who can produce therapeutic effects on superficial lesions only will often be found as defective in making diagnoses of deep-seated lesions. Any

technique and even any inefficient apparatus will effect superficial lesions just as they will make pictures, and some diagnoses in the bones of the hand and arm. The progress which has marked the development of improved technique in Roentgen diagnosis will find its counterpart in Roentgen therapeutics. The effects of varying qualities of Roentgen rays in therapeutics is now being studied as were their effects upon diagnosis. There is a more accurate application and greater efficiency already manifest. Three years ago it took twenty-eight treatments to cure an epithelioma of the eyelid, which has remained cured since. A similar growth was removed, apparently as effectively, this winter in fourteen treatments. The result was due to an improved technique and an adaptation of the fitting quality of ray to the disease. The qualities peculiarly adapted to each variety and situation of disease are being gradually determined; many of them are already known. Advances and better results have followed and will follow each improvement in technique.

The means for measuring the amount of energy flowing through the tube have been improved, so that it is possible to compare the technique of different operators more accurately and to determine in what the effective treatment for each lesion consists.

When and how should this therapeutic agent be applied to make it most effective and of the greatest benefit to the patient?

In malignant disease it should undoubtedly be employed in conjunction with operation, not as a substitute for it, but as a component part of the treatment. Up to the advent of the Roentgen method of treatment early radical surgical removal of so much of the diseased tissues as was possible was the most efficient treatment known. That, however, cannot be as truly said now. The efficiency of the Roentgen treatment has been demonstrated to be great; it is capable of modifying the malignant nature of the cells, retarding their growth, if not totally destroying them. Surgery cannot, therefore, be said to be the most efficient treatment unless it is combined with thorough postoperative Roentgen treatment.

Surgical operation and Roentgen treatment are not antagonistic, but are mutually helpful and supplementary, and the patient's greatest good can be served only when they are combined. The time for applying the Roentgen rays should be either immediately

after operation or just before, as a preparatory treatment to reduce the energy of growth of the cells and destroy the outlying cells.

The patient has the best chance of permanent relief from malignant disease who is brought early for operation, and that operation followed immediately by a thorough course of Roentgen treatment. The treatment must be as severe as the patient can stand, both locally and through the systemic effects, if it is to be of value.

A marked dermatitis or tanning of the skin must be produced or sufficient severity in the dose has not been employed. Auto-intoxication from the absorption of the dissolved malignant cells must be expected if efficient dosage has been employed where there are large growths. In cases where treatment is efficient this autointoxication will manifest itself in rheumatic pains in muscles and joints, disturbances of the stomach and liver, and a general feeling of malaise. The detection of these symptoms is an indication for the interruption of treatment for one or two weeks, as its continuance would put the patient in bed. It is, however, an indication of effective treatment. Such symptoms can, however, be produced only where there are large masses of tissue of low vitality that can be affected, as in massive recurrences or inoperable growths. It is to obviate this absorption and to hasten treatment that palliative operations can be employed in practically hopeless cases before the Roentgen rays are used. The inhibitory action, together with the ability to relieve pain where nerve trunks are not involved in the disease, makes the Roentgen rays the most potent palliative remedy known in the late stages of malignant disease.

TREATMENT OF NON-MALIGNANT DISEASES BY THE ROENTGEN RAY.[1]

By RUSSELL H. BOGGS, M.D.,
PITTSBURG, PA.

During the past four years a great many diseases have been treated by the Roentgen rays, and, since we know what can be accomplished by this powerful therapeutic agent, the time has come when we should draw a line between those diseases which should and those which should not be treated by this method.

I can safely state that any one who has made a careful study of radiotherapy realizes the value of the rays in certain diseases. While a large number of obstinate skin lesions can be cured by this method, when the rays are properly applied, it is a fallacy to treat many of the trivial affections which can be cured.

It should be our object to treat every patient with the therapeutic agent that is the most effective and produces a cure in the shortest time. At the present time there seems to be a diversity of opinion among the various dermatologists in regard to the value of the Roentgen rays in the treatment of some of the most obstinate skin lesions which are best treated by this method. One will state that he has been successful in every case of acne so treated, while another will say that he believes acne should not be treated by the rays, but that radiotherapy is almost a specific for eczema and psoriasis. When these different reports are carefully analyzed, and the technique of each studied it is plain why such conclusions are drawn. It is a well-known fact that, in order to do successful radiotherapy, it is just as essential for the operator to know how to apply the rays as it is for him to make a differential diagnosis.

[1] Read February 1, 1905, by invitation.

The Roentgen rays must be prescribed and given in a therapeutic dose for each disease, if results are expected. The dosage depends upon the quality and quantity absorbed, and one of these is as important as the other in giving a therapeutic dose, and to do the most successful work they must be varied to suit each individual case.

It is a well-known fact that tissues are not always affected to the same extent by the same dose any more than the same dose of a drug will always produce the same physiological action. But by studying the patient and disease the same as before prescribing drugs, almost as uniform results in producing reactions can be obtained.

Idiosyncracy is not a frequent cause of burns. A diseased area reacts more readily than normal tissue just the same as a patient whose vitality is low will burn more quickly than a healthy subject. A patient with a weak heart does not stand chloroform as well as one whose organs are normal, and when the patient does not stand the drug well we realize it is due to a known cause. The same is true of radiotherapy.

Now, why does the ray effect a cure in certain skin lesions where the older remedies fail? Possibly because the local therapeutic effect is deeper than that of the stimulating drugs.

All living tissues undergo a change when under the influence of the Roentgen rays. If the dose is very small, stimulation takes place, thus increasing nutrition; but larger doses will produce atrophy and degeneration. This depends upon the vitality of the tissues. Thus the nails, hair papillæ and glandular structures may be injuriously influenced, while the surrounding structures will be stimulated. It has been noted by various observers that the *x*-ray inflammation in the corium is followed by migrations of leukocytes.

If any operator has observed how much easier it is to burn carcinomatous tissue after the larger vessels supplying the malignant growth have been tied, he will readily see that the vitality of the tissues determines whether a given dose of *x*-ray increases or decreases the nutrition. It is not the *x*-ray which cures the patient, but it is the judgment of the operator in applying the rays. While skin diseases suitable to the *x*-ray are far more easily affected by

the rays than deeper-seated lesions, it is just as essential, in order to secure the largest percentage of cures, to have a technique by which the rays are absorbed.

Acne. Acne has a very important place in Roentgen ray therapy, because it is often a very obstinate disease to treat by the older methods. In comparing this method to curettage and incision, the rays give uniformly better results, and in these chronic cases pitting and scarring are usually avoided. This alone is sufficient to justify treating all cases of the pustular type by the *x*-ray. On the other hand, it would not be wise to treat every case of acne of the milder type by the *x*-ray. In the treatment of acne, it is likely that the rays cure by producing a leukocytosis, which is produced by a dose not large enough to produce degeneration.

The degree to which the reaction must be carried to effect a cure in acne varies with the severity of the case. From my own experience, as well as that of others, it seems safe to state that 75 per cent. of all cases of acne can be cured without producing any noticeable reaction, and in the other 25 per cent. it will be necessary to produce a reaction which will cause peeling equal to a severe sunburn. If in the 75 per cent. of the cases the acne was cured and disappeared without producing any noticeable reaction, I believe we would have 25 per cent. of recurrences. So far, I have not had a recurrence in a case where reaction was followed by a peeling of the skin.

The following case, referred by Dr. Voight, had acne for eight years, being the papular and pustular form, and covering the face and back. The patient had consulted and had been treated by two dermatologists in Philadelphia, one in New York, and several in Pittsburg. He had received some benefit, but this was only temporary. The amount of scarring and pitting was decidedly noticeable. A treatment, three times a week, was given for three months, when the disease had entirely disappeared. It is now eighteen months since the last treatment, and there has been no recurrence. The rays caused a disappearance of a great deal of the scarring. It is a well-known fact that the *x*-ray causes a disappearance of scars in many cases.

The treatment of acne requires considerable experience in

studying the case before deciding upon a therapeutic dose. Again, certain tubes will produce a certain amount of tanning while others will produce scarcely any.

Lupus. In the treatment of lupus, no other agents can be compared with the *x*-ray and Finsen light. Which of these gives the best results has occasioned considerable discussion. In Europe the Finsen light seems to have the preference, while in this country the *x*-ray is used the most. The method of using each is most likely accountable for the preference in the various places. In Europe the Finsen apparatus is more powerful than that which is usually employed in this country. In order to secure penetration, it is necessary to use a large arc which consumes considerable current.

The *x*-ray produces results much quicker than the Finsen light, but probably in some cases, where the area is small, it is advisable to use the Finsen method. I usually begin with the *x*-ray, continue until a slight dermatitis is produced, and then use the Finsen light. By so doing, I believe, time is saved and, as a rule, the results are better. The cases of lupus vulgaris which apparently cannot be cured by this method are usually either not treated for a sufficient length of time, or the disease is very extensive and involves the deeper tissues, and the patient is in very poor physical condition. It is not wise to discontinue treatment after all visible signs of the disease have disappeared. After the disease is apparently cured, I always advise the patient to take a few additional *x*-ray treatments and produce a slight reddening again. Where this has been adopted I have had no recurrences up to the present time.

I believe in some of the cases which have been treated in the past for lupus, there was a mistaken diagnosis. While visiting different laboratories, I have seen cases which were undoubtedly not lupus, but syphilitic ulcers. This spoils our statistics, because when adjunct treatments are given, we do not know which has cured our patients.

I had 2 cases of this kind that did not heal until they were put on anti-syphilitic treatment. Each had undergone a long treatment of potassium iodide before coming for the *x*-ray. Now, were these 2 cases syphilitic ulcers, and did the *x*-ray stimulate the ulcers sufficiently to heal? My diagnosis was syphilitic ulcers.

I shall report the following case to show why some physicians are doubtful about the utility of the *x*-ray in the treatment of lupus vulgaris:

Mrs. B., aged thirty years, had been treated at intervals for nine years for lupus vulgaris of the nose. She had been to ten or twelve physicians during this time, and they all made a diagnosis of lupus. One was a prominent dermatologist and a professor in one of the large Eastern schools. He treated the patient a year and three months, the disease gradually becoming worse, and when the patient came to my office the point of the nose was entirely destroyed. While under the dermatologist's care, she requested to be treated by the *x*-ray, and she was accordingly referred to the *x*-ray laboratory, but the dermatologist must have been extremely afraid of an overdose of the *x*-ray, as he instructed the radiotherapeutist under no circumstances to give an exposure of more than three minutes. The patient was given eight treatments, and the radiotherapeutist refused to give any more treatments unless he was allowed to give his usual exposure, which was fifteen minutes. This was three years ago, but it was counted as one of the *x*-ray failures to show results. This summer it required three months to effect a cure.

In the treatment of glandular diseases, viz., tuberculous, Hodgkin's disease, and goitre, much has been accomplished by the use of the *x*-ray. I will not mention the results which have been had in carcinoma of the glands any further than to state that the *x*-ray will destroy the particles which cannot be reached by the knife. An excellent illustration of this was mentioned by Dr. Hulst when he stated that the removal of the mass might be compared to a man shovelling snow off the street, but after he had done his work as thoroughly as possible there would be left in the cracks a small amount of snow. He stated the snow could be removed from the cracks by salt. Thus the surgeon might be compared to the snow shoveller and the radiotherapeutist to the man who sprinkles the salt.

I believe this comparison will apply to tuberculous glands as well, because if one gland is involved and removed, very likely the disease will involve adjacent glands.

It has been advocated not to operate on tuberculous glands except when they contain pus, and then just make an incision for drainage. Here, the same as in the treatment of other diseases, it is well in many cases to consult a surgeon before the treatment is begun. The cosmetic results are certainly better when the

cases are treated by the rays, and the danger of secondary involvement is lessened.

Sufficient evidence has been shown in the treatment of goitre to advocate the use of the Roentgen ray. A certain few cases have responded readily when all other forms of treatment have been disappointing. In some of the cases that I have seen the growth would only be reduced about one-half, but the symptoms had disappeared. This alone would be sufficient evidence to justify the patient in taking the treatment.

I have treated 6 cases, 3 of which were apparently cured, but in which slight enlargement remained.

A few cases of Hodgkin's disease have been reported as cured by the *x*-ray and, since this disease is so hopeless under the usual treatment, it seems advisable to submit these cases to treatment for the purpose of prolonging the patient's life and the possibility of effecting a cure. A remarkable fact in most cases has been shown after a few treatments in the improvement of the general condition of the patient.

Conclusions. 1. That it is necessary to distinguish between the non-malignant diseases which should, and those which should not be treated by the *x*-ray.

2. That while the continual cry of technique may become tiresome to some who think the subject can be mastered in a few days or a couple of months, the method of application of the rays and the judgment of the operator accounts largely for successful or unsuccessful work.

3. That it is just as essential to administer a therapeutic dose when applying the Roentgen rays as it is when prescribing powerful drugs.

4. That idiosyncracy is not a frequent cause of excessive dermatitis.

5. That a dosage which causes stimulation of healthy tissues will usually produce a slight reaction in diseased tissues.

6. That at all times it should be remembered that it is not so much the *x*-ray that cures as the judgment with which it is employed.

7. That the *x*-ray is one of the best therapeutic agents known for the treatment of acne and many other skin diseases, but is

unnecessary in many instances to treat the trivial and less obstinate cases by this method.

8. That the *x*-ray, supplemented by Finsen light, is the most efficient therapeutic agent for the treatment of lupus.

9. That the *x*-ray is the most efficient agent for the treatment of certain tuberculous glands, Hodgkin's disease, and selected cases of goitre.

X-RAY TREATMENT OF MALIGNANT GROWTHS.[1]

By ENNION G. WILLIAMS, M.D.,
RICHMOND, VA.

I BEGAN *x*-ray work as a skeptic, doubting the therapeutic value of the ray. After giving my first case of epithelioma six exposures and seeing the scab become thicker, I advised the patient that the growth be excised. This was done, and I examined the tissue microscopically and was impressed with the decided retrogressive changes observed in the carcinomatous cells. The next epithelioma I treated with more confidence and in six weeks it had healed.

The results of the practical use of the ray as reported by different operators have varied greatly. The general profession has been misled by the over-enthusiastic as well as by the pessimistic operators, so that the true value of the ray has yet to be found out. It is not a magic light that will heal every malignant growth to which it is applied, nor should it be placed upon the shelf with other discarded therapeutic agents.

It is a natural force of great variation, having a decided influence upon living organic matter.

The microscopic changes in the tissues which have been exposed to the *x*-ray have been studied and reported by many observers, and their observations, in general, agree. It is these observations which should give us the basis for the possibilities and limitations of the ray.

To determine the value of the ray as a therapeutic agent we have to consider: first, the factors concerned in the production and variation of the *x*-ray and the methods of the application in

[1] Read February 1, 1905, by invitation.

treatment; secondly, the histological changes due to the *x*-ray; and, thirdly, the nature and location of the growth to be treated.

The *x*-ray is capable of wide variation, both in its penetrating quality and in its intensity or effective energy. Among the variable factors that have to be considered in each treatment are the voltage and ampèreage of the current supplied to the primary, the number of interruptions made by the interrupter, the resistance in the secondary circuit represented by the number of spark gaps in series, and the degree of vacuum of the tube, the distance of the tube from the surface to be exposed, and the duration and frequency of the exposures. The successful application of the ray is dependent upon the proper co-ordination of these factors for each individual case.

Until recently there was no way to measure the energy given off from a tube. This could only be approximated by one's experience with his individual apparatus. The invention of Snooks' milliammeter marks a distinct advance and enables one to measure the dosage with a greater degree of accuracy. The technique is being steadily improved by experience and the proper appreciation of the physical laws governing the ray, especially that the intensity varies inversely as the square of the distance.

With so many variable factors to be considered in the proper application of the ray, there is no wonder that the therapeutic results of different operators have been so inconstant.

According to the effective energy given off from a tube, there are decided changes in the tissues as revealed by microscopic examination; cells are affected and undergo atrophy or granular degeneration. The nuclei stain feebly, become swollen, vacuolated, and disappear or break into fragments. The cells swell, lose their outlines, become granular, and disintegrate. These changes are especially noticeable in the cells of glands, hair follicles, the skin, and those lining the bloodvessels, but to a less extent the muscles and connective tissues are affected. The effect upon these latter may be secondary, dependent upon the inflammatory process resulting from the death of the cellular elements. There is more or less round-cell infiltration, depending upon the degree of reaction. The ray may stimulate or even increase the vitality of the less differentiated tissues.

From these observations it is evident that the elements of the tissues which are most affected by the ray are the cells, and in the proportion that they exhibit the manifestations of life. Dead organic matter is not influenced by the ray. Another evidence that the ray acts upon the vitality or life of a cell is the fact that a tissue, immediately after a destructive exposure to the ray, shows no macroscopic or microscopic change, and it is only after the lapse of several days that there begin to appear the changes consequent upon the death of the cells. We would conclude, therefore, that the tissues most influenced by the ray are those having a large proportion of cells whose vital processes are very active. Such tissues are found chiefly in malignant tumors, carcinomas, and sarcomas. It is upon them, therefore, that the ray has the most decided effect.

The benign tumors are composed largely of intercellular substance, with a small proportion of cells not actively proliferating. They are, therefore, only slightly or not at all influenced by the ray. We thus understand why epithelial tissue, on account of the large proportion of cells, is affected more than any other normal tissue, and why the cells of the glands and hair follicles, because their vital processes are more active, succumb before the cells of the skin.

If now, as it seems, the ray affects cells in proportion to their vital activities, it is to be expected that the actively proliferating cells of the malignant growths will be more susceptible to the influence of the ray than the cells of the skin and subcutaneous tissues, which exhibit the vital manifestations in a less degree. This explains the apparent selective action of the ray for malignant growths. If the ray is properly applied, a tumor of this kind may be destroyed and disappear without any destruction of the surrounding normal tissues.

From these considerations we conclude that the prognosis in the treatment of new-growths depends upon the character of the growths, and upon their accessibility to the proper quantity of radiant energy. Since we have shown that the tissues composing the malignant growths are especially susceptible to the ray, the prognosis in their treatment depends upon their accessibility to a ray of sufficient energy. Success or failure depends upon the

accomplishment of these two objects by the proper co-ordination of the variable factors in applying the ray. The light might have the proper energy, but unless it reaches the entire growth, especially the periphery, where the rapid growth takes place, it will be of no avail. On the other hand, the light might reach every part of the growth, but, unless it does so having sufficient energy, it will not accomplish its work.

From what has been said it may be inferred that the growths most readily and uniformly healed are the superficial carcinomas and sarcomas, and this *is* the result of actual practice.

The deeper the growth the more doubtful becomes the prognosis, because of the difficulty to carry deep into the tissues a ray of sufficient energy to destroy malignant cells without destroying the overlying tissues. That moderately deep growths can be affected has been shown by too many well-authenticated cases. The difficulty has been in establishing a technique by which results may be obtained with a fair degree of constancy.

To show by example the difficulties in treating a deep growth and how they are to be overcome: suppose we are to treat a carcinoma four inches below the surface, and that the time required to destroy carcinomatous cells on the surface be one hundred minutes, with a tube at ten inches' distance. By experience, we know that it takes a much longer time to produce a redness of the neighboring normal tissues and a still longer time for their destruction.

X-ray operators of much experience have seen epitheliomas disappear without producing even a redness of the surrounding skin. If, then, one hundred minutes is required to destroy malignant cells, we can assume that one hundred and eighty minutes will be required to destroy the healthy cells—the tube being ten inches distant. According to the law of the variation of intensity, the equivalent of one hundred minutes at ten inches is two hundred minutes at fourteen inches. In other words, to destroy the growth at fourteen inches there must be an exposure of two hundred minutes, which would cause a necrosis of the overlying tissues. But if we place the tube eighteen inches from the surface the growth will be twenty-two inches from the tube. The number of minutes required to destroy the growth will be five hundred

minutes, and the number of minutes required to produce a necrosis on the surface at eighteen inches will be six hundred minutes. Thus we see that it is possible by increasing the distance from the tube to destroy a deep growth without destroying the overlying tissues. What is impossible to accomplish with a tube at ten inches is possible with a tube at eighteen inches.

In the example cited above there is a margin of one hundred minutes. This can be drawn upon to compensate for the loss of energy due to penetration. Another point to be considered, in the treatment of deep growths, is that the ray must be more penetrating. The more penetrating a ray, the less is its effective energy; therefore due compensation must be made in the duration of the exposure.

In the preceding remarks I have attempted to give a clear idea of the *x*-ray as a therapeutic agent, and the factors to be considered in the production and application, and also to explain its influence upon living cells, and why it is especially adapted to the treatment of malignant tumors. It now remains for us to consider its use in the treatment of those conditions as compared with other therapeutic agents.

For superficial growths the ray is indicated because it is so uniformly successful, its application is painless, there is less scar and deformity, and the growth is less apt to recur than with any other form of treatment.

For deep growths, until we can show more uniformly good results, radical surgical procedures should be recommended. We must give the patient the benefit of the probabilities and not possibilities. It is, however, but rational that the surgical procedure should be followed by sufficient *x*-ray exposure to destroy malignant cells several inches from the surface. This is possible, as has been shown, and the patient should have every possible chance to have the malignant cells completely eradicated or destroyed.

Inoperable cases should be treated with the ray because remarkable results have been obtained, and the most distressing symptom, pain, may at least be relieved.

It is by means of these cases that we must demonstrate the value of the *x*-ray and extend its usefulness.

In conclusion, I would reiterate that we have in the *x*-ray an agent that has a specific and destructive effect upon malignant tumors, by taking away the life of their cells, and that its application in treatment is limited only by the ability to reach the growths with the proper amount of energy and safety to the surrounding parts.

This mysterious form of radiant energy is still in its infancy; yet what it has already accomplished makes us hope and expect that we can, by careful study and conservative practice, bring it more and more to our aid, especially in destroying the malignant tumors which are mercilessly attacking their victims with increasing and alarming frequency.

DISCUSSION ON X-RAY SYMPOSIUM.

Dr. George C. Johnston, of Pittsburg (by invitation): I have devoted my time for some four years to this subject and have found it very fascinating. I have endeavored to keep pace with the rapid advancement of medicine and surgery, and I believe the time has come when it is necessary to make inquiry into the claims of this agent as a remedial one. There is no doubt that a great many of the loudly mouthed claims that have been put forth are the direct offspring of the illegitimate union of over-enthusiasm and inexperience. On the other hand, we have a mass of evidence put forth by some of the best men of the profession, men of age, experience, and mature judgment, and we cannot but accept their judgment in this matter. The truth of the majority of their claims can be demonstrated, and those which it is not possible yet to demonstrate should be received in a state of mind thoroughly open to conviction if evidence in their support can be adduced. Radiotherapy has been accused of many things. It has been claimed that suggestion plays a major part, that the results are due to the procedure and apparatus employed, and to the effect thus produced upon the patient rather than to the agent itself. I will accept this absurdity as a possibility as soon as a single case of dermatitis is produced by an inactive Roentgen tube, or a tube made of lead glass and incapable of the emission of *x*-ray. The efficiency of the agent is doubted by many, because results in similar cases are very irregular. That is capable of a simple explanation. It is not the *x*-ray that cures, any more than digitalis cures a case of heart disease. The cure depends entirely upon the way in which the remedy is administered. Suppose you had two cases of disease similar in extent, location, severity, age of patient, etc. In the practice of one operator Case A will terminate successfully. Case B., in the hands of an operator seemingly

equally qualified, will not do well, whereupon the treatment will be abandoned and the method condemned. The fallacious character of any reasoning based upon these results is apparent. The success or failure in the application of this agent or in any other depends upon the dose. The dose of the *x*-ray is a composition of several factors: 1. The length of time during which the agent is allowed to act; this we can measure and record with an absolute degree of accuracy. 2. The distance from the source of the ray to the patient. 3. The degree of vacuum of the tube which is emitting the Roentgen ray. This is one of the hardest problems in all physics. It is incapable of any accurate measurement by any means short of the actual observation of the radiation itself. It is the attempt to measure that by actual observation which accounts for the condition of the hands of many of the older workers. Some of us have given up the attempt to measure that radiation. The invention of a bright young fellow of Philadelphia has done much to accomplish this. He has produced an ammeter that measures the volume of the current that passes through the tube. It measures that alone, however, and not the individual efficiency of each particular tube in its office as a transformer of electric energy into cathode rays, *x*-rays, and a number of *X's*. If you have a certain tube the resistance of which you know, and take the reading of an ammeter, you have the load which the tube is carrying. If the vacuum of the tube changes, the volume also changes.

Another fact in the dosage is penetration, and upon this depends the securing of an effect. A ray of little penetration will treat skin disease very efficiently. On the other hand, in a case of sarcoma in which the tissues are more dense than bone, there must be a deep penetration. You must have a penetration adapted to the depth to which you wish to penetrate. You see that this subject requires careful investigation if a man hopes to have success. Success or failure is no more luck than success or failure is luck in therapeutics or surgery. Some tubes will burn easily, and this has caused considerable discussion. I always advise a beginner to mark every new tube as suspicious, and to use them in radiographic work before trying them on a patient. To test a tube on a plate will cost you fifty cents. If you test it on a patient it may cost you $50,000 (if you have it). Some of the tubes that light up a fluoroscopic screen brilliantly are worthless in the deeper radiographic work. They have no penetrating power, and do not accomplish the reduction of the silver salts upon the photographic plate; whereas, another tube that will not light up the screen may have this power. Such a tube is a valuable and active therapeutic agent when it is necessary to produce a definite reduction of pathological tissue in a limited time.

If a man expects to do radiographic work, he must have a certain technique, with every detail of which he must be familiar. In doing radiotherapeutic work, he must have a technique more exact than that for picture work, but capable of immediate variation to suit each case. He must make a study of individual cases if he expects to get results. This has been illustrated in cases treated for such diseases as lupus, in which the treatment has simply irritated

the disease. I have seen such cases promptly cured afterward by a few proper exposures.

The subject of malignant disease is one I hesitate to approach. To me the history of the treatment of malignant disease by the *x*-ray is one I would rather forget. It is made up of the treatment of any and every variety of disease, in every location, and of every degree of severity, with the hope held out to the patient of a cure, and with the loss of many valuable lives that might have been saved had the advocates been more experienced and less enthusiastic. My own conscience is clear. There are a few men to-day who are the proud possessors of more or less *x*-ray apparatus, who hold it up before the public as a means of cure of malignant disease "without the knife." This cherished phrase is not original with them, but with their reflections, the pile doctors and quack paste men.

The legitimate *x*-ray man does not consider himself the successor of the obsolete surgeon. On the contrary, he is proud to be accorded the position of qualified assistant to the surgeon, believing that he has at his command an agent which will afford the surgeon better results in his malignant cases. A course of postoperative or preoperative radiation is frequently effective in limiting the disease. A course of postoperative radiation, I believe, is frequently effective in clearing out any possible foci of disease left by operation. In operation for malignancy, no matter how carefully performed or how skilfully done, it is necessary to leave a little of the patient. No man can say when he operates for malignant disease that he has removed all of the malignant disease, unless he has removed all of the patient. I know of no man who is able to draw his finger around malignant disease and say, "Within this is malignant; outside there is no malignancy." Following radical operation for cancer in the breast (and by radical operation I mean Halsted's operation, and not some man's modification that leaves out the essential part, where the operation goes in to the chest wall, into the axilla, and back under the scapula, if necessary), no man can be certain that he has removed every possible foci or malignancy. In such cases the surgeon can confer upon his patient an added safety by the administration of a series of exposures. I have demonstrated to my own satisfaction that the *x*-ray has the power of inhibiting the growth of malignant tissue. If it has that power, and if the inhibition be continued long enough, we may hope that the malignant tissue may settle down and forget to be an anarchist.

The prevention of recurrence has been spoken of by many surgeons. R. W. Stewart expressed the opinion that an enormous safety factor was conferred upon the patient by postoperative radiation. This treatment, however, should not be left to an assistant or nurse.

The future of malignancy depends upon the general practitioner, because he sees the cases first. I find that each month there come to me more of these early cases of cancer of the breast, in which you have to ask the patient which breast the lump is in. In such cases I recommend a Halsted operation, and radiotherapy to prevent recurrence. We have cases apparently cured by this

method, which remain so. I prefer to call them cases of inhibition more or less permanent, which we hope will remain permanent. What *x*-ray workers of today need and want is the co-operation of the surgeons and pathologists. We are trying our best to get a perfect technique and apparatus, but cannot we do the pathological work necessary? As soon as we all work together in harmony, I feel that the future of malignancy and of other diseases will be very much brighter.

Dr. John B. Shober: My experience in the use of the *x*-ray as a therapeutic agent is limited. Two years ago I began to investigate the value of this agent in diseases peculiar to women, especially in pelvic carcinoma. I was led to undertake this investigation by one or two articles claiming results that seemed to me extraordinary. I found that I had undertaken the most difficult kind of *x*-ray work. There was very little literature on the subject and no technique. I have treated six or seven cases of carcinoma of the cervix, inoperable, primary, and recurrent. In all the cases I have noted the inhibitory action of this agent upon the disease. In the last eight or nine months since the technique has been improved, the inhibitory action has been very marked, in that women who have been bedridden and deplorably ill, with a foul discharge and severe pain, have been almost invariably benefited so that they were able to be about with decrease of pain and hemorrhage. I would like to mention a case following hysterectomy for carcinoma of the uterus, in which a recurrent growth occurred in the vagina a few weeks after operation. She was sent to me by Dr. Beyea for treatment. There was a small nodule, about the size of a large English walnut, in the left lateral wall of the vagina, which was upon the site of the scar from which Dr. Beyea had removed a growth which proved under the microscope to be a carcinoma. The patient was put upon the treatment by the technique which we had developed at that time. In the course of ten weeks the growth had disappeared. The patient has remained perfectly well since, with no sign of recurrence. In that case, not only were large tubes with high vacuum used, and applications made from fifteen to twenty minutes at a time, sometimes every day, but also the therapeutic tubes for insertion in the vagina were employed. Also a very powerful radium was used (10 mgs. of the Currie 300,000) every other day during the course of treatment. I desire to mention also a case of carcinoma of the breast. She was sent by Dr. Downs, of Germantown, with the statement that she positively refused operation, which was advised by two well-known surgeons. I undertook the case, with the understanding that if the growth should develop under treatment, she would consent to operation. It was a small growth under the pectoral muscle of the left breast, about the size of a guinea-hen's egg. She was treated by means of the *x*-ray alone, and to my surprise, and great pleasure, the growth began first to increase in size, but to soften. The pain down the left arm disappeared, and in a few months the growth had diminished two-thirds in size.

She was referred to Dr. Pfahler, who treated her occasionally through the summer months, and when I returned in the fall there was no sign of the

growth except a small induration, possibly the result of an accumulation of fibrous tissue in the site of the disease.

Dr. George Erety Shoemaker: I think the College owes a cordial vote of thanks to the four gentlemen who have presented this scientific subject in a scientific way. They have placed it before the College in a way that cannot help but be instructive. The scientific side must appeal to those men who are devoting their whole time to it. The practical side appeals to the surgeon. In the light of present evidence, I have for my own work adopted a definite plan of procedure in all forms of malignant disease. After the surgeon's work is done, he owes it to his patient to have *x*-ray treatment applied for a definite time. In the case of cancer of the uterus I advise in treatment: first, the cautery as thoroughly applied as possible; after the slough has separated, hysterectomy, including the cautery scar, and after that the *x*-ray. It seems to me that this treatment offers the most hope in a field which has been discouraging, but discouraging largely because cases are not seen early.

Dr. W. S. Newcomet: I do not think the profession in general realize the position and what the men in this field are trying to do, but we cannot help becoming, perhaps, too enthusiastic in our work, when we see moribund cases react for a time and often get well. About two years ago, before the American Roentgen Ray Society, I made the statement I did not believe it was the fact that a deep growth or the superficial growth when treated right got well, but recovery depended upon whether these growths were slow or rapidly growing processes. A slow-growing mass, whether deep or superficial, treated by the *x*-ray will get well, as a rule, while in the rapidly growing tumors the results are usually very poor, not so much on account of the local process, but usually from metastasis. We have here lately been treating a great many other diseases with *x*-ray, and I had hoped to present a few of them to-night to show the results, but they are not present. In one, a case of tuberculous ulceration following an extensive operation for the removal of the cervical glands on both sides of the neck, followed by a long ulcerating wound, which had not healed. Although the operation was some eighteen months previous, about six weeks' *x*-ray treatment gave relief by healing, and it has now been well almost two years.

I was requested by Dr. Leonard to show on the screen the picture of a case of trachoma. About two years ago, with Dr. Krall, I took up the treatment of a series of cases of this disease, and in the case shown the condition was present from the time the girl was three months old. The treatment was given in two series of six weeks each, extending over about a year. Before treatment the girl could only count fingers held between the source of light, and now she is able to see objects two or three squares away.

Dr. Leonard closes: I think the papers show the results that have been achieved, and that work is being done in pushing this method of treatment onward; undoubtedly, we can expect much more from the treatment now since the technique has been developed. I believe that the future is brighter than the past, and that the *x*-ray will show us in time something which will at least

ameliorate some of the sad conditions which follow operation. The surgeon operates and returns the patient to the general practitioner, and over 50 per cent. of the cases die. That condition is a very serious one for the consideration of the medical profession, and if there is any agent capable of inhibiting the primary growth, as well as the metastasis, that agent needs to be studied carefully, not only by *x*-ray men, but by pathologists and general practitioners.

THE RELIEF OF URÆMIC HEMIPLEGIA AND OTHER URÆMIC STATES BY LOWERING INTRA-CRANIAL PRESSURE (TEN CASES).[1]

By ROBERT N. WILLSON, M.D.

In a previous communication were published the results of lumbar puncture and drainage of the cerebrospinal canal as evidenced by three suggestive, but eventually fatal cases. The author's conclusions, as stated at that time and based upon the experience of these cases, were essentially as follows:

1. Probably several toxins exert an influence in uræmia at different times and in different cases.

2. Other portions of the brain than the cortex are also affected by the causal influence in uræmia.

3. Intracranial pressure is usually in evidence, either independently or in conjunction with toxic irritation and tissue destruction.

4. In cases in which intracranial pressure is the main factor, lumbar puncture of itself may save life. It should constitute one of the routine measures in the treatment of uræmia.

5. Transfusion of normal salt solution, except in cases presenting anuria or a markedly diminished secretion, is contraindicated.

6. Drainage of the spinal canal will not cure purely toxic cases.

Other workers in the Philadelphia Hospital were, at the time of the publication of the former paper, so discouraged with their unfortunate results as to frown upon the procedure and to prevent its further employment in their wards. With this knowledge as a drawback my own, at first partial, but highly satisfactory,

[1] Read March 1, 1905.

results were obtained. It is because I have gradually convinced myself that the experience of those who have failed to obtain successful results with lumbar puncture in uræmia has been due to a series of unfavorable coincidences, and because I have since demonstrated with what seems to me a certainty, and by means of an unusually rich series of cases, the value of the procedure, that I have ventured to place my results before the College and the profession for criticism.

It is my intention in this paper to omit, at least in its beginning, all primary reference to any one toxin as a causative factor, assuming at once that a toxin or toxins are present in every case of uræmia, whether playing a prominent part or filling a minor role.

That conclusion 2 (with regard to the involvement of portions of the brain other than the cortex) has been amply proven will also be taken for granted: (*a*) because of clinical evidence cited in the previous paper; (*b*) on the ground of the autopsy findings in the brain of Case III. of the previous series; (*c*) based also upon Weisenberg's discovery of pathological changes in the brain tissue even when macroscopic lesions were absent; (*d*) and still more positively upon the post-mortem dilatation of the lateral ventricles noted in every case of uræmia that has come to autopsy following the ante-mortem removal of excessive quantities of cerebro-spinal fluid.

There remain for active discussion, however, three important considerations:

1. To what extent does intracranial pressure influence the occasional case which responds favorably to spinal drainage?

2. To what extent does it influence the *average* uræmia?

3. What influence, if any, will relief of intracranial and intravascular tension exert upon an assumed dominant toxæmia?

Before proceeding to the discussion of these questions it will be interesting and instructive to briefly outline the clinical pictures upon which this subsequent study has rested, constituting as the cases do two instances of uræmic coma with convulsions, one of simple uræmic coma, two of uræmic hemiplegia, convulsions, and amaurosis, and one of severe uræmic asthma. Of these cases two patients (representing three instances of uræmic seizure treated

by spinal drainage) are still alive at the time of writing. Only one case considered in this paper died before a sufficient interval had elapsed to demonstrate the value of the measure. Nearly all promptly recovered, at least for the time being, from the uræmic attack.

Case I. *Instance of Uræmic Coma and Convulsions.*—J. C., white, male, aged eighty-two years. The patient was admitted to the wards of the Philadelphia Hospital on October 5, 1904. He was greatly exhausted; showed considerable dyspnœa, due to a marked cardiac dilatation and to congestion of both pulmonary bases. The radial and temporal arteries were calcified and beaded, there was marked accentuation and a metallic clang of the second aortic sound, and at the apex a systolic murmur, presumably of a relative mitral insufficiency. The legs, penis, and scrotum were markedly œdematous. The urine contained large quantities of albumin and many hyaline and hyalogranular casts. A few days after admission his œdema had entirely disappeared, but he began to complain of headaches, vomited nearly all his food, his breath was decidedly urinous, and coma gradually supervened. On the same day there occurred a general uræmic convulsion, and two attempts at venesection proved unsuccessful, the veins collapsing as soon as opened. Lumbar puncture was performed, the fluid spurting nearly an inch from the cannula. During the operation a second general convulsion occurred. Slightly over two ounces of clear fluid was withdrawn, the flow then ceasing. At once the pulse became less angry, and the second aortic sound became less active and less metallic. Within a brief half-hour the patient was fully conscious and talking to the nurse in attendance. He knew nothing of the lumbar puncture. When next seen by the writer on the following morning his mind was clear, headache was gone, the urinous odor had disappeared from his breath, and he expressed himself as feeling "pretty well." There were no further convulsions, no return of the coma, and, indeed, no sign suggestive of uræmia. The urine gradually showed less albumin and less microscopic sediment. On November 7, 1904, he sat up in a chair, but almost collapsed, and was replaced in bed. From that day on his physical failure was gradual, though his mind was invariably clear. He lived until 11.30 P.M., fifty-six days after the uræmic attack, and then died of asthenia.

Autopsy Findings. Arteries sclerotic and calcareous over the entire body. Marked emphysema of the lungs, covering a large dilatation of the ascending aorta (not aneurysmal). Cardiac valves fairly normal; no gross valvular lesion; marked cardiac dilatation. Both kidneys show a high-grade interstitial nephritis, and a subacute inflammation, with considerable fatty change. The *brain* externally appeared normal. Both lateral ventricles were enormously distended, so as to hold easily an ounce of fluid each, though containing at the time only about one drachm. No hemorrhage was found, and no gross destructive lesion present. The brain tissue did not appear to be distinctly œdematous.

Case II. *Instance of Uræmic Coma and Convulsions.*—T. F. M., white, male, aged thirty-six years. Patient admitted to the Philadelphia Hospital on November 6, 1904, from the police patrol. He was completely comatose when admitted. His urine, drawn by catheter, contained nearly 50 per cent. albumin by volume, and many granular casts. His pupils were unequal, the right larger than the left, but both were dilated. The respiration was stertorous. The patient could be aroused, but relapsed at once into stupor. He was purged and given a hot pack, and following the latter his temperature rose to 104°. He then had two severe general convulsions at short intervals, and later a third. Nystagmus appeared, and coma became profound. Lumbar puncture was then performed by the resident physician, and about one ounce of clear cerebrospinal fluid was withdrawn. Two hours later the patient could be easily aroused, and seemed markedly improved. Venesection was then done, six ounces of blood being extracted in the hope of further improvement. Unfortunately, as it afterward appeared, one and one-half pints of normal salt solution were introduced into a vein, and within a half-hour three convulsions had occurred, and again profound coma appeared.

Lumbar puncture was again performed, and again over an ounce of cerebrospinal fluid was withdrawn, although the canal had been emptied not four hours previously. There was no improvement on this occasion, however, and the patient died before morning. An autopsy was not allowed.

Case III. *Instance of Uræmic Coma.*—E. McD., white, male, aged thirty-eight years. The patient was admitted to the wards of the Philadelphia Hospital on October 28, 1904, following a debauch. There was partial coma, which increased during the next three days, though at no time was it possible to rouse him by questions. The arteries were hard and fibrous, the second aortic sound was loud and metallic, and the heart much dilated. The urine contained large quantities of albumin, and many casts of all forms. The breath was distinctly urinous. On November 2, 1904, lumbar puncture was performed, the fluid spurting from the needle, and about an ounce being obtained. There was absolutely no improvement in the condition, and on the following day twenty ounces of blood were removed by venesection. Improvement was extremely slight, if present at all, and consciousness was never regained.

The patient rapidly emaciated, and died on November 11, 1904, Autopsy was not permitted.

Case IV. *Instance of Uræmic Hemiplegia, Convulsions, and Amaurosis.*—M. W., colored, female, aged fifty-two years. Admitted to the Philadelphia Hospital on November 28, 1904, with a history of an attack several months previously, in which she fell and was unconscious "for a few minutes." She had then recovered completely. Her hands and feet had never swollen, but she had been subject to headache. On the day of her admission she had fallen again, owing to sudden unconsciousness. The patient knew nothing of these falls, and stated that she had felt merely a numb feeling in her left arm for about an hour on the morning of her last attack (the present one). On awak-

ing from her stupor she was in the hospital, convalescent, with a dim recollection of the pain of my incision prior to the lumbar puncture.

On admission the patient was profoundly comatose, with complete paralysis of the left side of the body. Both pupils were contracted, the peripheral arteries were hard and fibrous (the radials beaded), the pulse of high tension, and the second aortic sound characteristically accentuated and metallic. The heart was greatly dilated. The lungs appeared negative. There was no œdema, even the pretibial tissues showing no sign of pitting on pressure. Lumbar puncture was performed. Five drachms of cerebrospinal fluid flowed from the cannula, at first with force, and later dripping slowly as in health. At once the patient seemed brighter mentally, and an hour later moved both the arm and leg freely, and discussed "what had been done to her back" intelligently and clearly. She could, however, see almost nothing except the gaslight. On the following morning the paralysis had entirely disappeared, and the patient was able to see clearly with her spectacles as usual. The pulse was at this time slow and full and the second aortic sound much less angry and metallic than previously. Headache was completely gone. On December 7, 1904, she sat out of bed, and two days later was walking freely around the ward, feeling strong and well.

Case V. *Instance of Recurrent Hemiplegia and Convulsions.*—Same patient as Case IV. Remained in the Philadelphia Hospital and was free from symptoms until December 31st, when she described a numb feeling in her left arm and side, headache, and dimness of vision. The urine contained a trace of albumin, and showed a constantly low specific gravity. The pulse was of high tension, and the second aortic sound angry and metallic in its accentuation. She was placed in bed, and the next morning felt well and was again around the ward. On January 3d she again felt numbness in her left arm, had severe headache, and about 10 A.M. noticed her left hand and fingers twitching. She was placed in bed, and at 12 o'clock, noon, the twitching had increased to violent rhythmic movements of the left hand, and soon of the left arm, later of the left side of the face, and then involving the left leg, until the convulsive movements included the whole left side. Consciousness was preserved, and the patient stated that she had severe headache, but that her eyesight was clear. At 1.30 P.M. there was complete hemiplegia of the left side, though uncontrollable convulsive movements were almost constant. Lumbar puncture was performed with the only needle obtainable, of a very small, unsatisfactory size, and about 10 c.c. of fluid withdrawn, but, the needle becoming plugged, no more could be obtained. The convulsion became general about 3 P.M., and at 4.30 P.M. lumbar puncture was done with a small trocar and cannula, and considerably over one ounce of cerebrospinal fluid withdrawn. The latter was blood-tinged. During and prior to the operation the convulsive movements became very active. When asked to raise her arms and legs, the patient responded with her right limbs, but failed completely with the left. Sensation was diminished on the hemiplegic side. The reflexes were almost absent upon the same side. The pupils were contracted and equal.

While the fluid was still flowing from the cannula the patient suddenly relaxed and the convulsive movements disappeared, to recur once or twice very slightly, and then to disappear finally within five minutes of the withdrawal of the cannula. The headache was relieved to a great extent at once during this attack; the eyesight at no time was impaired. One-half hour after the lumbar puncture the hemiplegia was still complete. Two hours later (7 P.M.) the patient raised her left hand, and at 10 P.M. the entire left side was under control. Her convalescence from that time was steady.

On the evening of January 6th (three days later) the patient suddenly went into a general epileptiform convulsion, was completely unconscious during the convulsive seizure, after which her mind gradually cleared. There was no paralysis. One hour later a second convulsion followed. The spinal canal was punctured, but no fluid could be withdrawn, although the cannula was repeatedly extracted and reinserted in the canal. In the emergency bleeding was resorted to. The veins collapsed as fast as they were opened, and, finally, the radial artery was incised and twenty-three and one-half ounces of blood removed. Within an hour the patient had a third convulsion, and from that time for twelve hours was in a state of constant delirium. The radial pulse, which had been obliterated, was faintly palpable on the succeeding day (twenty hours later); the left radial was of a markedly high tension. With the idea that, having relieved all fluid pressure, the remaining uræmia, including the high pulse tension, must be purely toxic, aconite was given in 5-drop doses and later 10-drop doses every two hours, and with gradually favorable results, the patient relaxing, and finally returning to a state of rest. The high tension of the radial pulse gave way to a normal condition, and the second aortic sound lost much of its metallic quality and accentuation.

This patient recovered entirely, and returned home feeling well. As long as she was under observation her constant tendency to a pulse of high tension was controlled by the intermittent use of aconite.

CASE VI. *Instance of Uræmic Asthma.*—W. E., white, male, aged forty-four years. Admitted to the Philadelphia Hospital on July 7, 1904, suffering from rheumatism of the toe and thumb. As this subsided his legs began to swell. His arteries were stiff and fibrous, his heart dilated, his second aortic sound metallic and loud, and his urine contained considerable albumin and many hyaline and granular casts. He remained in bed from July to October, 1904, and then began to suffer from dyspnœa, especially at night. He also had now to rise several times during the night to urinate. The dyspnœa soon developed into severe attacks of asthma; his face became puffy and swollen, as did also his lumbar regions, his buttocks, and gradually his legs. Nitroglycerin and caffeine were used continuously. When at last the asthmatic attacks made their appearance every few hours, it became a matter of almost certainty that they were due to uræmic poisoning or to uræmic intracranial tension.

On October 3, 1904, venesection was done by the resident physician, and ten ounces of blood removed, with marked temporary relief from the dyspnœa. The asthma recurred, however, and on October 13, 1904, venesection was done

on the other arm, the same amount of blood being withdrawn, and temporary improvement again following. The radial pulse disappeared on the side of the operation for about four days following the latter, and then suddenly reappeared. His legs, buttocks, and face were greatly distended with fluid, and on elevating his legs his abdomen showed distinct fluctuation, which disappeared when both the body and legs were finally lowered. About October 18, 1904, the asthmatic seizures recurred and became very severe. Lumbar puncture was done on October 20th, the cerebrospinal fluid spurting out until one and three-quarter ounces were obtained. Immediate relief was experienced, and from this time until November 8, 1904, (eighteen days) he was free from distress, and then had a brief attack, which proved to be his last up to the present time. The œdema gradually disappeared until on December 2, 1904, there was no pitting on pressure, even over the pretibial area. The patient was then dressed and out of bed for the first time in six months. Two days later he returned to bed with an acute attack of rheumatic inflammation of the ankle-joint, but with no indication of uræmic or other renal embarrassment.

On December 26th there was a protracted convulsive movement of his arms and legs, lasting for three-quarters of an hour, and disappearing as suddenly as it occurred. Consciousness was preserved throughout the attack, whatever its doubtful nature may have been. A definite statement certainly cannot be made as to whether it was or was not uræmic, though, as there was neither chill nor fever, and the pulse remained normal, the patient conversing with the nurse and the resident physician throughout the seizure, I have been inclined to consider it hysterical in character. Since that time bronchopneumonia and pleurisy have successively complicated the nephritis, but the uræmic symptoms have failed to reappear.

Case VII. *Case of Uræmic Coma and Delirium.*—E. J., white, male, aged sixty-eight years. Admitted to the Philadelphia Hospital on December 27, 1904, with ruptured cardiac compensation, dyspnœa, and quite marked œdema of the extremities. His lung showed a small area of bronchopneumonia. The urine contained large quantities of albumin, and many granular casts of all forms. On January 4, 1905, the patient's breath was distinctly urinous, his mind was not clear, the temperature rose from subnormal to 101°, the respiratory rate from normal to 40, and the pulse from 50 to 120. Delirium soon became prominent, restraint in bed being necessary. On January 4, 1905, the condition was somewhat improved, though there was the same odor of urine upon the breath, and the mind was by no means clear. Lumbar puncture was performed and one and one-half ounces of clear cerebrospinal fluid obtained. The temperature fell within three hours from 101° to subnormal, the pulse from 110 to 50 and then to 80, where it remained; the respiratory rate became 20. Within three hours the patient answered questions intelligently, and was fully conscious.

On January 7, 1905, delirium returned, with incontinence of feces and urine, and death ensued during the night.

The *autopsy* showed: Cerebral œdema, both lateral ventricles apparently dilated, chronic adhesive pleurisy, hydrothorax, chronic interstitial nephritis, acute pyelitis, cystitis, urethritis, and red atrophy of the liver.

In a brief backward glance at the foregoing cases we may frame the following synopses:

Case I. *Urœmic coma and convulsions* in a man aged eighty-two years. Lumbar puncture; two ounces of fluid withdrawn. Recovery. Death fifty-six days later. Autopsy: greatly dilated lateral ventricles.

Case II. *Urœmic coma and convulsions* in a man aged thirty-six years. Lumbar puncture; one ounce of fluid withdrawn. Improvement. Transfusion of salt solution, followed at once by relapse. Second lumbar puncture four hours after first; again one ounce withdrawn. No improvement; death.

Case III. *Urœmic coma* in a man aged thirty-eight years. Lumbar puncture; one ounce of fluid obtained. No improvement. Venesection (twenty ounces), with slight temporary improvement. Death.

Case IV. *Urœmic hemiplegia, convulsions, and amaurosis* in a woman aged fifty-two years. Lumbar puncture; five drachms withdrawn, with prompt disappearance of the hemiplegia and of the amaurosis. Recovery.

Case V. *Convalescent urœmic hemiplegia.* One month later recurrence of the convulsions and left-sided hemiplegia. Lumbar puncture; one and one-third ounces of fluid removed. Immediate cessation of the convulsive seizure and disappearance of the hemiplegia within three hours.

Case VI. *Urœmic asthma.* (1) venesection, (2) venesection; improvement following both, then relapse. Lumbar puncture (one and three-quarter ounces), with almost complete and finally permanent relief. Recovery.

Case VII. *Urœmic coma and delirium.* Lumbar puncture, followed within two hours by a return to consciousness. Recurrence of condition, and death two days later.

In order to render the following discussion as practical as possible the three questions already proposed may be cited and answered seriatim:

1. *To what extent does intracranial pressure influence the occasional case of uræmia which responds to spinal drainage?* The answer to this question may be based upon the following evidence offered: (*a*) by the physical signs, before and after lumbar puncture; (*b*) by the influence of the latter upon uræmic coma (complete or partial); (*c*) by its influence upon the uræmic convulsion; (*d*) by its influence upon uræmic monoplegia or hemiplegia; (*e*) by its influence upon uræmic asthma; (*f*) by its influence upon uræmic amaurosis.

Among the *physical signs* indicative of intracranial and intravascular pressure are the coma, the pupillary abnormalities, the hemiplegia (temporary), the pulse of hypertension, the angrily accentuated second aortic sound, and the convulsive movements.

Without considering these in detail it may be assumed as a matter of common knowledge and agreement that all of the foregoing may be caused by excessive intracranial pressure. Not only have Gowers' studies shown that a pressure of 130 mm. exerted upon the brain of a dog is sufficient to cause coma, but many other clinical examples witness the fact that one form and another of intracranial pressure—cyst, tumor, bony outgrowth, cicatrix—may cause singly or in combination all of the remaining phenomena which I have mentioned.

The converse is equally well proven by the cases cited in this paper, viz., that these phenomena disappear, as a rule, upon relief of intracerebrospinal pressure. In every instance in which improvement has been noted the coma has been at least partially, and usually completely, relieved with such promptness as to leave no doubt as to the causal influence; hemiplegia, when present, has been caused to disappear; monoplegia (Case III., Series 1) likewise; the pulse has become softer and even normal; amaurosis has disappeared; the aortic second sound has become less accentuated and less metallic; the convulsive movements have (even in eventually unfavorable cases) ceased, and at times before the flow of cerebrospinal fluid had stopped.

With special reference to the *coma* it will be observed that in 2 of the series of 3 cases reported in my former communication, and in 5 out of the 7 cases in the present series, the coma disappeared almost immediately (within two hours) after

the withdrawal of evidently overlarge quantities of contained cerebrospinal fluid. In Case I. of the former series consciousness was never fully restored, but within a few minutes mental clearing was apparent. In Case II. consciousness was completely restored within a few hours of the operation. In Case III. consciousness became almost complete after each of three daily lumbar punctures. In Case I. of the present series consciousness was complete within a half-hour from a previous deep coma; Case II., also previously in deep coma, could be aroused within two hours, but following venesclysis relapsed and died; Case III. showed no improvement; Case IV. regained consciousness within an hour; Case V. (same patient) did not lose consciousness; Case VI. did not lose consciousness; Case VII. regained complete consciousness in about one and one-half hours. Thus, of 10 cases of uræmia 8 were comatose and 6 regained consciousness shortly after spinal drainage.

Three cases (Case III. of the first series and the present Cases IV. and V.) exhibited *paralysis*, the former an oculomotor palsy and the latter two complete hemiplegia. In all these instances the paralysis was relieved, and in the hemiplegic woman the change was remarkable, from a complete left-sided hemiplegia to a free use and control of her entire body within twelve hours, and to a partial use at once.

Of the 10 cases included in the two series 6 suffered from *convulsive movements*, in five instances general and in two (one patient) limited to the hemiplegic side. In every case in which spinal drainage was instituted the convulsions terminated with the withdrawal of the cerebrospinal fluid, and in only 1 case did they recur within several weeks of the operation. In Case V. the convulsions were at one time general, following two attacks of unilateral convulsions and hemiplegia.

Of the 10 cases only 1 gave certain evidence of true *amaurosis*, and this disappeared within a few hours after the lumbar puncture; 1 case showed typical *uræmic asthma* as its most prominent feature, the breath at the same time being distinctly urinous. The asthmatic attacks were relieved twice by bleeding, and the third time by spinal drainage, and since the latter have not recurred.

Treatment Employed. In all of the foregoing cases the routine treatment planned consisted of free purging, drainage of

the spinal canal, and occasionally bleeding. Only those cases in which lumbar puncture formed the sole treatment at that particular time are, however, considered in this paper. Two cases were transfused with normal salt solution and both died, one of these showed improvement until the salt solution was introduced, whereupon, promptly relapsing into coma and convulsions, death ensued. The hot pack has invariably appeared to me to cause high temperature and a weak, running pulse, and in no case has seemed to be certainly beneficial.

In Cases I. of the present series and in IV., V., and VII., all instances of profound coma, convulsions, and in one instance hemiplegia, absolutely no other measure was employed than drainage of the cerebrospinal canal.

Spinal drainage, bleeding, and overfree purging seemed to act similarly in their respective order of promptness and efficiency. The similarity of the action of lumbar puncture and venesection was most evident in Case VI. (renal asthma). Aconite appeared to exert a decided and invaluable influence in counteracting the uræmic, adrenalin-like toxin, and thus reducing intravascular hypertension when fluid pressure had been dissipated in vain (Case V.).

It would appear to be a fair inference from the foregoing that in all except Case III. (of the present series), namely, in nine of ten instances, relief of intracranial pressure effectually relieved the symptom-complex known as uræmia; and similarly, it would, on the same grounds, seem reasonable to conclude that intracranial overpressure, whether due to toxæmia or whatever cause, was at least the dominant factor causing the uræmic picture in these particular instances. In Case VI. intracranial pressure seemed at first to be the only factor, and later appeared to have no hand in the affair, which then suggested a toxic influence only.

2. *To what degree does intracranial pressure influence the average case of uræmia?* In order to arrive at any conclusion it becomes necessary to analyze the cases of uræmia reported in medical literature to the present date which have been treated in the main or solely by lumbar puncture and drainage of the spinal canal. Of my own 10 cases all but 1 showed marked improvement within the two hours following the withdrawal of the fluid, and Cases I.

and V. of the present series showed almost instantaneous return to consciousness and quiet. In Case IV. the severe headache suddenly disappeared. Of these 10 cases 5 improved so far as to be entirely free from uræmic symptioms; 5 died too soon after the operation to warrant the statement that final recovery from uræmia took place, in spite of the return to consciousness and the cessation of convulsive movements.

While a sufficient number of instances of lumbar puncture in uræmia has been recorded up to date to justify an estimate of the value of the procedure, the list is by no means extensive. McVail has reported 2 cases of uræmic coma and convulsions both of which recovered, for the time being at least. Seiffert has also reported several instances of uræmic convulsions and coma in the course of scarlatina in which prompt recovery followed lumbar puncture. Hand has recently described a case of uræmia in typhoid fever in a child, responding promptly to spinal drainage.

During the last three years there have been many instances of intracranial hypertension in which lumbar puncture has been employed other than those of uræmia, which illustrate the same principle. In many the symptoms were identical with those of the uræmic state. Among them the following are most suggestive:

Huber has relieved otitis, serous meningitis, also the cerebrospinal form of typhoid fever, and true cerebrospinal meningitis in three different patients by lumbar puncture (*Arch. Pediatr.*, January, 1904).

Boky (*Jahrb. f. Kinderheilk.*, February, 1903) has permanently cured acute hydrocephalus by repeated (fifteen and upward) and persistent tappings and withdrawal of the cerebrospinal fluid. He notes that Concetti has cured another patient by tapping fifty times within two years and with capital final results. Many observers, among them Warrington (*Pediatrics*, February, 1903), have drained the spinal canal in meningitis with prompt return of the patient to consciousness, and with relief from other symptoms. Lumbar puncture has also been used in bronchopulmonary lesions, and Nobecourt and Voisin (*Revue mens. des mal. de l'enf.*, vol. xxi., 1903) have reported its use in 31 such instances in children. In 7 of these there were no meningeal phenomena, while in 24 it was marked. Of the 24 meningeal cases only 4

survived, the symptoms varying from mere stiffness of the neck to convulsions. Of the 7 cases without meningeal symptoms the cerebrospinal fluid was clear and usually sterile. In the meningeal series it was turbid, and contained many polynuclear leukocytes and bacteria.

Babinski (*La revue méd.*, No. 435, 1902, p. 713) reports an interesting case of meningitis in a young girl, aged twelve years, in whom the fluid obtained by lumbar puncture spurted out in a turbid stream. During the month several subsequent punctures gave the same result, and at last recovery ensued.

S. O. Golden (*American Medicine*, December 27, 1902) records a case of meningitis with convulsions in a child, with protrusion of the fontanelles, the latter subsiding at once upon draining the fluid from the spinal canal.

Syphilitic cephalalgia has also been relieved in this manner by Millan (*Semaine méd.*, June, 1902) in Fournier's service; and Rochard (*Presse méd.*, No. 35, 1902) has restored consciousness promptly in fracture of the skull by draining in the same fashion.

Herbert Rhodes (*British Medical Journal*, July 11, 1903) has called attention to the prompt relief following lumbar puncture in pain in a case of gliosarcoma of the optic thalamus; also to the relief of coma in a case of postbasal meningitis. Hodskins and Norton have published a most interesting series of cases of status epilepticus treated by lumbar puncture, in 6 of which there was positive improvement, and recovery in 4 cases, attended by marked lowering of the blood pressure.

Each and all of these cases demonstrate the fact that when cerebrospinal fluid is present in excess, and in quantities sufficient to exert intracranial overpressure, the symptoms due to hypertension are promptly relieved by drainage following lumbar puncture. In all but 1 of my own 10 cases, and in all of the instances of lumbar puncture in uræmia reported by other observers, there has been the same prompt relief from pressure symptoms whether the case eventually recovered or proved fatal. In all the cases observed by me there was a marked change not only in the volume, but in the rate and force of the radial and apical pulse, and frequently a corresponding fall in the temperature and respiratory rate. I shall deal in a subsequent paper with the

actual fall in blood pressure resulting from drainage of the spinal canal. When the fluid spurted from the needle improvement was almost invariably (with one exception) prompt and usually permanent. If it simply dropped as if reluctant to flow, the improvement was much less positive. The average amount of cerebrospinal fluid obtained was considerably over an ounce, and in one case (I.) over two ounces were obtained.

In all of my cases except III. and V. (in her third attack) the result of spinal drainage was gratifying. In Case III. absolutely no improvement was noted in spite of the fact that an ounce of fluid was withdrawn. One such case goes far toward proving that occasionally the toxæmia or the local influence of the toxin is so profound as to dominate the symptom-complex, in which event lumbar puncture is futile. Such a case can be isolated from the average only by the failure of spinal drainage and bleeding, or in the event of a dry condition of the canal, as in Case V. (in her third attack). The great majority of cases will respond at least partially, and many completely, to lumbar puncture, and many others to this procedure when reinforced by bleeding, free purging, diuresis, and the use of aconite. It would seem warranted to say that lumbar puncture should be employed in every case of uræmia, and should be looked upon as one of the most important features of the routine treatment.

3. *In what manner does drainage of the cerebrospinal canal exert an influence upon intracranial pressure, and what other procedures may exert a similar influence?* It seems certain from the autopsies in Cases III. of my former series, and I. and VII. of the present series, that in certain instances of uræmia, if not all, the brain tissue suffers from fluid pressure. This affects the parenchmya itself, distends the ventricles and the spinal canal, and in Case III. of the former report led to the formation of a cystic cavity in the brain substance leading from the posterior horn of the left lateral ventricle.

Drainage of the cerebrospinal canal indubitably relieves the excess of fluid, as is proven both by the appearance of dilatation of the ventricles at the autopsy and by the repeated dry tapping of Case V. following an earlier puncture which showed an excess of fluid. (Note: This occurrence should not lead to the conclusion

that the fluid does not, as a rule, re-collect. It usually does; in this case it did not.)

The prompt relief from clinical symptoms furnishes still more satisfactory proof of this point. It also goes to show that in certain instances the injury to the cortical motor centres is only temporary and independent of the occasional destruction of cellular tissue described by Weisenberg as occurring in uræmia, and referred to in my previous communication. That wholesale destruction may occur is evidenced by this very cyst formation, even more certainly than by microscopic study. I consider the question still *sub judice* whether this tissue change should be credited altogether to the action of a toxin, as held by Weisenberg, or whether perhaps direct pressure may not have an equal or even greater influence in certain instances. The mechanism seems to be somewhat as follows: Owing both to the toxæmia and to the high-grade arteriosclerosis, hypertension of the arterial and venous circulation prevails, and, as a consequence, an increasing hypertension of the cerebral blood channels. Possibly the toxin carried to the brain by the bloodvessels exerts a local action also upon the various motor centres. Thus we find working side by side a toxin and fluid pressure, the latter often in the form of œdema, and both capable of producing a similar series of brain symptoms, and both acting, many times, in conjunction. Possibly the excess of fluid is directly due to the influence of the toxin upon the brain tissue, or upon the meninges, or in any event to strictly local influences. For certain it is that fluid pressure occurs most frequently in persons who are entirely free from general œdema or effusion other than that in the cerebrospinal cavity. The toxin may, therefore, be the predominant factor, or, as more frequently occurs, if we can judge from a series of cases like my own, the excess of fluid within the cranium may of itself produce the uræmic picture. Whether the uræmic picture is due to the one or the other is of little clinical consequence, provided the withdrawal of the fluid relieves the symptoms. But the very relief of such symptoms as headache, convulsions, amaurosis, and coma, by mere drainage of the cerebrospinal canal, forces to the conclusion that portions of the brain are sometimes encroached upon, and that sometimes there is even an isolated involvement of one or

more motor centres. This is most rationally explained by the assumption of a localized collection of fluid which, in favorable cases, disappears under the influence of lumbar puncture. Free drainage of the canal depletes at once the ventricles, the brain tissue, and possibly also the venous channels ultimately. Free bleeding must accomplish the same result by working from the opposite direction—*i. e.*, through the circulation, and secondarily through such a relief of congestive pressure. The latter is, of course, a much more indirect, a slower, and, therefore, less efficacious process. Bleeding, free diuresis and purging, and sweating act in the same manner by relieving the general arterial hypertension, and indirectly by relieving intracranial blood pressure. Aconite seems to act in a similar manner by depressing the cardiac vigor and thus diminishing the amount of blood forced with each systole into the already overfull brain and by dilating or relaxing the vessel walls. Nitroglycerin dilates the peripheral vessels to accommodate the excess of blood, but, unfortunately, also whips up the heart into new exertions, so as to further increase the systolic output. Of all these adjuvant measures free bleeding, from a vein or artery, seems to be the most rational procedure after lumbar puncture, and only second in importance to the direct drainage of the tissues of the central nervous system.

Thus it seems fair to assume that cerebrospinal drainage relieves the symptoms of uræmia by directly relieving the excess of fluid in the brain cavities and brain tissue, and that in certain cases the fluid must be repeatedly removed until it ceases to reform and re-collect within the cranium.

4. *What influence, if any, will relief of intracranial hypertension exert upon a dominant uræmic toxæmia?* The discussion of this question must rest upon the assumption that (1) a toxin or toxins are actually at work in uræmia; and (2) that the vascular hypertension is the direct result of a toxæmia; and (3) that the intracranial overpressure which characterizes certain cases is due to the excess of cerebrospinal fluid manufactured as a direct outcome and result of the toxic state.

If we admit these theories to be founded upon a fair basis of probability it is easy to proceed a step farther and assume that

by relief of intracranial tension, which itself is a result of toxic irritation, we neutralize and gradually lessen the influence of the toxin, which may exhaust itself in this manner in vain, the spinal drainage serving the role of safety valve or exhaust. There is also the possibility, though nothing more, that a significant amount of toxin is abstracted with the cerebrospinal fluid, and also by bleeding, and that in this way the amount of toxin was directly reduced. The experiments of Hughes and Carter, reported in the Boylston Prize Essay, would seem to indicate that the blood serum of uræmic human beings and less so that of the healthy human organism was toxic at least for dogs. Our own animal experiments (reported in my former communication) seem to demonstrate conclusively that the cerebrospinal fluid of uræmic persons contains no principle deleterious to the smaller animals. My feeling at the present time is that in all cases of uræmia both a toxin (or toxins) and intracranial pressure are at work, and that relief from either must to that degree enable the patient to withstand the assaults of the other.

Transfusion of Normal Salt Solution in Uræmia. I have already emphasized my conviction that transfusion of normal salt solution in uræmia is contrary to what we know to be beneficial to the state of the individual at the time. Even when there is only the likelihood and not the certainty of intracranial pressure, the result of introducing liquids into the circulation will be to still further raise the pressure. If we first bleed in order to abstract the toxin and reduce pressure, and then transfuse in the hope of diluting the toxin (a theory at one time in prime favor), we at once restore one of the conditions most active in producing the symptom-complex of uræmia, namely, intravascular and intracranial pressure. A striking demonstration of the truth of this assertion was obtained in Case II. (this series), which showed decided improvement following the spinal drainage. The resident physician then extracted a small quantity of blood and introduced in its place a considerable quantity of normal salt solution. This procedure was promptly followed by convulsive seizures and coma, and the second lumbar puncture obtained as much cerebrospinal fluid as the first, although the canal had been drained dry not over three hours before. Novi has produced the complete

picture of uræmia in dogs by the injection of a 10 per cent. solution of common salt solution into the blood stream until the latter attained a concentration twice that of the normal. Landois has produced "coma and convulsions by simply applying a sodium chloride solution to the surface of the cerebral cortex. As the substance was absorbed the attacks grew slighter, and perfect recovery at times ensued." (Quoted from previous communication.)

These facts lead me to the conclusion that no good end can be served and much ill may be accomplished by venesclysis in uræmia, while its opposite, free depletion, is an ideal procedure from every point of view.

Method and Indications for Lumbar Puncture. In all of my cases I have followed a method of proeedure founded partially upon the technique employed by others and partly upon the difficulties experienced in several of my first cases. A frequent cause of failure to obtain the cerebrospinal canal is the employment of an instrument that is too short to reach its destination. Another source of difficulty lies in the fact that a needle is commonly used, the lumen of which cannot be cleared while *in situ*. And finally, most cases of failure are noted in subjects with a thick adipose or muscular layer over the spinal column, in which the spinous processes are obscured or lost, as is also considerable of the needle's length. I used in my second case and still constantly employ a small troear and cannula, the latter nearly 8 cm. in length, and its lumen measuring 1.5 mm. This instrument was resorted to owing to the fact that the small needle used in the first operation repeatedly became clogged in its passage through the cartilage, and in this case more than once failed to reach the canal.

In difficult cases I have recently made a small incision over the upper lumbar vertebræ large enough for the insertion of the forefinger. With the patient in the lateral position I then introduce the troear and cannula between the first and second or the second and third lumbar vertebræ. Klein recommends the third and fourth interspaces, and publishes an illustrative series of diagrams showing the relative positions of the vertebræ in the cadaver. The instrument passes along the finger, then downward

and slightly outward beside the spinous process, feeling for the yielding of the cartilage. The feel as the trocar leaves the bone and enters the cartilage is unmistakable, and as the needle cannot penetrate any other structures so long as it keeps fairly close to the spinous process, it is probable that the first yielding surface is the sought-for intervertebral disk.

Ossipow (*Deutsche Zeitsch. f. Nervenheilkunde*, Heft 2) has pointed out the various dangers of the otherwise very simple operation, but with cleanliness and care in the presence of undoubted uræmia there should be no time lost in proceeding to the operation. Fatal meningitis has been caused where none existed before (Mathes, *Centralbl. f. Gynäkol.*, 1904, vol. xxviii., No. 8), and Fürbringer, Krönig, and Lichtheim have all reported cases of death following the puncture. The latter observers withdrew at times 100 to 150 c.c., reducing the intraspinal pressure from 420 to 180 mm. of mercury. Millan cites (*Semaine méd.*, June 18, 1902) the case of a young woman punctured for chronic headaches, in whom extremely severe headache followed with vertigo, nausea, and vomiting. In contrast with such occurrences I must cite the present series of cases, in each of which relief, not aggravation, of the symptoms was the result.

I have obtained my best results in cases in which the fluid spurted from the cannula. In some of these the serum was clear and in some bloody; thus in all the present series of cases the fluid was clear, except one in which blood (which promptly coagulated and probably originated in a punctured vessel) and serum flowed from the cannula together. This case, however, showed a most prompt and gratifying result and is still alive as evidence of the success of the treatment.

I have also obtained clear and again bloody fluid from cases which proved afterward to be fatal. A syringe-pump is never necessary, as the fluid is present in excessive quantity and will force its way out of the tube as soon as the latter enters the canal; and I believe that many of the unfortunate results have been due to the use of the syringe. On the other hand, it is my belief that all cerebrospinal fluid should be withdrawn, notwithstanding Ossipow's conclusion that hemorrhage into the brain and cord are likely after the withdrawal of considerable quantities of

cerebrospinal fluid. I have seen no unfortunate results attributable to the operation in any of my cases and in some I have allowed the wound to drain for several days, to obviate the necessity of repeating the puncture. In one case I drained the cerebrospinal canal for more than three days with excellent results, the fluid escaping in such profusion as to keep a thick gauze dressing and the night-clothes constantly moist. Of Seiffert's cases there were two in which he did repeated lumbar puncture, recovery resulting. I have already cited Boky's, Concetti's, and my own cases in which repeated punctures were performed with final benefit to the patient. Occasionally the cerebrospinal fluid is bloody, and sometimes it flows like thick blood. Normally it is thin and clear. The bloody fluid may take its character from an admixture of blood from torn vessels outside the canal, or from vessels in the dura mater, or in the pia mater. If the latter is the source the fluids should become clear upon withdrawing the cannula a short distance. Blood from a vessel will also promptly coagulate in the air under ordinary circumstances; blood from the spinal canal will not and can not owing to thorough mixture with the cerebrospinal fluid. If the ruptured vessel is in the dura mater, a little deeper insertion into the canal will clear it of contact with the bleeding surface. If a trocar and cannula be employed the plunger can clear away obstructions to the tube at the will of the operator. A yellowish or reddish tint usually indicates the presence in the fluid of hæmoglobin or of red corpuscles actually in solution.

In summing up my conclusions I would call especial attention to the fact that by no means all cases that show chronic interstitial nephritis are subject to uræmia, and to the still more important circumstance that neither sclerosis of the kidney nor, in fact, arteriosclerosis becomes dangerous until hypertension of the vascular system is superadded. The two states by no means always go hand in hand. Many cases of high-grade sclerosis present a comparatively normal blood pressure. Certain cases of hypertension show little or no sclerosis, and yet apoplexy occurs. Add to sclerosis of the arteries and veins hypertension, however, with the consequent intracranial tension due to this and to local toxic irritation, and we have present at once ideal conditions for the causation of the uræmic picture.

The preceding study of ten cases, treated entirely with a view to relieving intracranial pressure, appears to warrant the following conclusions:

1. The belief is reaffirmed that various toxins are influential in producing the symptoms in various instances of uræmia. Among these probably the most important is one originating in an abnormal digestive tract, and resembling adrenalin in its physiological action, as suggested by Thomson.

2. Whether as a result of or a coincidence with toxic irritation, intracranial overpressure, due to an accumulation of cerebrospinal fluid, may and usually does cause the majority of the classical symptoms of uræmia, and is often the dominant influence.

3. Spinal drainage may, and in many cases does, promptly relieve the symptoms of uræmia, furnishing clinical proof of the foregoing statement.

4. Case V. demonstrates the fact, however, that occasionally when intracranial pressure has been removed the toxin may alone cause the picture of uræmia.

5. Uræmic manifestations (other than coma) when due to intracranial pressure may be either general or localized. Unilateral convulsions, convulsive movements of one limb, monoplegia, hemiplegia, motor or sensory aphasia, and similar phenomena are of rather frequent occurrence. The toxic influence, in the few instances in which it has seemed to act independently of intracranial pressure, has caused only general manifestations, usually of an irritative nature (convulsions, etc.), seldom or ever paralytic phenomena.

6. Uræmic hemiplegia and other uræmic paralyses are due usually to direct pressure upon or œdematous infiltration of the motor centres of the brain, and may usually be relieved by withdrawal of the cerebrospinal fluid.

7. There is a striking suggestiveness in the frequent absence of general œdema, though there be an excess of intracranial fluid, general œdema arising from an entirely different influence and cause. My most successful cases showed no œdema of the external body, but without exception a high degree of intravascular and intracranial tension.

8. Lumbar drainage should be employed as a routine measure,

together with all the known means of reducing systemic pressure or hypertension. Among these the most valuable are free bleeding, free purging, free diuresis, and the administration of large doses of aconite.

9. The ultimate cause of the arterial hypertension of uræmia has not yet been discovered. It would appear by no means impossible that the intracranial fluid pressure is the result of toxic inflammatory exudate; that this causes hypertension within the cranium and favors a similar hypertension throughout the general circulation, or *vice versa*, and that the symptom-complex of uræmia is thus usually due to such a sequence of causes. Probably uræmia cannot occur in the presence of a low tension in the intravascular and intracerebral systems.

10. It would appear from the failure in repeated instances to produce any deleterious effect upon healthy small animals by injecting successive small quantities of the cerebrospinal fluid from uræmic subjects that the toxic principle of uræmia is not to be found in the latter. The experiments of Hughes and Carter in 1893 seemed to show that it may possibly be found constantly present in small quantities in the normal blood serum.

11. While lumbar puncture is not infallible, nor devoid of a slight risk to the patient, the procedure should be employed early in the course of uræmia, and repeatedly if necessary to accomplish the lowering of systemic hypertension. It may save life and will often dissipate the uræmia, at least for the time being.

12. Transfusion of normal or other salt solution is harmful in uræmia, in that it causes an increase of intravascular and intracranial tension, and supplies certain of the conditions necessary to the uræmic seizure.

DISCUSSION.

Dr. William E. Hughes: This phase of the subject is peculiar and interesting in that it seems to promise some little in a very unpromising condition of affairs. Uræmia, as Dr. Willson says, must be due to a toxin or to toxins, probably to toxins, occasionally one of them being pre-eminently active; at times, others. This multiplicity of toxins will explain more easily than anything else the multiplicity of uræmic symptoms. Some of the cases are apparently purely toxic; others are associated with, or largely due to, increased vascular tension; others in which we have hemiplegias or monoplegias are due to increased intracranial tension. The difficulty is in the application of rational treatment to clearly differentiate the different forms. Unquestionably the way to do that is to apply the therapeutic test which Dr. Willson has suggested. In the purely toxic cases a reduction of intracranial pressure is of no avail, because there is no increase. In the increased vascular tension cases sometimes decrease in the intracranial pressure will be of great avail, because the intravascular tension may probably be increased as the result of the primary increase in the intracranial pressure. If the symptoms are due to increased intracranial pressure the result that will be obtained by lowering this increased tension can be nothing other than good.

The largest number are produced by simple toxins, or, at least, those in which toxins play such a preponderating part that only the elimination of this toxin can be of any use. The limited number are in those in which there is distinct increase of intracranial pressure, so distinct that it must be considered a causative factor. Exactly where the increased arterial tension comes in I have been unable to satisfy myself. Oftentimes one can relieve this increased tension by aconite or other drugs without unfavorable result.

As to the exact value of lumbar puncture in the treatment of uræmia I am very uncertain. I concur heartily with Dr. Willson that he has been able to get some distinctly favorable results that could not have been obtained in any other way, but I fear that such results are distinctly the exceptions, and that we will have to go on with our old-fashioned treatment of uræmia.

Drainage of the spinal canal is an easy operation when incision is made down on the spinal column, but that is objectionable in private practice.

As to the dangers of the operation, I am again uncertain, because I have not had sufficient personal experience. My own impression is that there is comparatively little danger. The one possibility of danger is the possibility of producing hemorrhage in the spinal canal. I do not see how the absolute relief of increased tension could endanger the patient, or could by any possibility determine blood enough to the cerebrospinal system to produce hemor-

rhage. In the first case in which I have seen this procedure used the patient was probably altogether toxic, showing the ordinary type of uræmia. Half an ounce of fluid was removed, but we did not empty the canal. The woman, however, promptly died.

The second case was that of a woman seen in consultation with Dr. Butcher. She had had a carcinoma of the breast removed nine months before her death. This was followed by a complete recovery, but later by pains, suggesting a return of the carcinoma along the spinal canal. Then she got a little stupid, the next day a little more stupid, and in the evening, after a sharp attack of pain in the back of the neck, she went into convulsions. There had been a very little albumin and very few casts in the urine, which was fully up to the normal quantity. I saw her at the beginning of the sixth convulsion. That was purely left side, and left her with absolute hemiplegia on the left side. Shortly after the cessation of the convulsion I introduced a needle into the spinal canal, but the fluid did not flow spontaneously.

By suction about two drachms were withdrawn, and again two drachms more, accompanied with bright blood. Convulsions did not recur, except one six hours later. The patient was restored to partial convalescence, and there was no increase in arterial tension. Twenty-four hours subsequently she had begun to drift again downward. The needle was reintroduced in the fourth interspace, and through moderate suction two ounces of dark-red blood, coagulating spontaneously immediately after withdrawal, were removed. These two ounces emptied the spinal canal and produced apparently no effect upon the woman, and she subsequently died. I do not know, however, that the lumbar puncture hastened death. Whether I was the cause of the hemorrhage in the canal, or whether the spontaneous hemorrhage in the canal had caused the convulsions, I am unable to say. My impression is that by puncturing a vessel I had produced the hemorrhage, and I believe this illustrates one of the possible dangers of the operation. I also believe that the danger is exceedingly remote, and that we are justified in taking our chances in this danger. My own impression of drainage of the spinal canal is that in the majority of cases it will do no good; that in the small number of cases, especially in those cases where there is a local symptomatology, those cases which used to be known as serous apoplexy, a great deal may be expected of it.

Dr. James Tyson: I regret that I cannot contribute any information upon this extremely practical and important subject, as I have made no application of the treatment and in no other way can it be judged. Both experiment and clinical observation have, however, seemed to establish the fact that a large majority of cases of uræmia are due to some toxic agent, however, produced and whatever its nature. I cannot conceive how drainage of the

spinal canal could relieve a uræmia due to toxic causes, unless it be by the removal of the toxic fluid itself, and, if this were accompanied by hypodermoclysis or intravenous injection to replace removed fluid, it is quite conceivable that the two combined might result in a dilution of the toxin which would relieve the symptoms. On the other hand, if uræmia is due to pressure it is difficult to understand why it should be any more quickly relieved by spinal puncture than by venesection. We know, too, that venesection of itself is of service in certain cases of uræmia, as illustrated by the effect of venesection in puerperal eclampsia. In uræmia associated with chronic Bright's disease venesection is more efficient if associated with intravenous injections of salt solution. This is explained by the rationale already given as to the withdrawal of toxin while diluting the retained toxin by the intravenous injection.

That intravenous injection or hypodermoclysis without venesection is not so likely to benefit a case of uræmia and can do no harm is borne out by my own experience. I should not think of using hypodermoclysis for the relief of uræmia without associating venesection. I think I have seen increased pressure upon the right side of the heart produce sudden death in a case of uræmia which I perhaps overtreated with hypodermoclysis in my desire to relieve symptoms. If I had first drawn blood and then introduced the saline solution I think I would have been less likely to do harm. Again, if uræmia is due to pressure I should expect venesection to be as efficient as spinal puncture. That uræmia is due to toxic agency is proven by other diseases than Bright's disease. A toxic hemiplegia is a well-recognized complication in diabetes mellitus. I have several times seen hemiplegia ensue upon this condition where there has been no question raised as to its toxic origin. We could scarcely in such cases ascribe the condition to brain-pressure.

Notwithstanding the fact that I look upon the new treatment with the skepticism that comes to one with some experience, I should be inclined to try Dr. Willson's treatment when opportunity presents, because it is, after all, only by clinical trial that we can determine the value of a method of treatment.

Dr. William M. L. Coplin: It has been shown by Krönig, Henkel, Kleinwachter, Helme, and others that in eclampsia the cerebrospinal pressure may be enormously increased. One case is recorded in which the pressure was 600 mm. Henkel's studies have not been favorable to lumbar puncture as a plan of treatment. These gentlemen have approached the subject a little more scientifically than we have in this country, measurement of the pressure being made to determine in what clinical conditions the pressure is elevated. In some of these cases the urea content of the fluid may be extraordinarily increased. No one assumes that the urea is in any way—or, at

most, in a very general way only—a measure of the intoxication in uræmia; nevertheless, the urea increase may be an indicator of the unknown toxic substance, with whose actions only are we familiar. For this urea excess in the body fluids Bonnier has proposed the term urhydria. It therefore appears to me as a wise method to have the tapping so made that we can determine the pressure, and probably be able in that way to recognize those cases in which the symptoms depend upon pressure, and by the urea and cerebrospinal fluid contents be able to determine those cases in which the irritation of the nervous centres is manifested by the presence in the cerebrospinal fluid of abnormal quantities of normal constituents, or of substances not normally demonstrable in the fluid.

As to injury of the cord or vessels I would think, in the hands of careful and experienced operators, there can be but little danger. It is stated that blood which clots after drawing and contains few or no shadow cells is the result of tapping. Blood in the exudate usually has completed coagulation, contains phantom erythrocytes, and is disproportionately rich in some form of leukocyte.

It seems to me that the Quincke puncture is far inferior to puncture made through the sacrolumbar space. The latter is easier and safer.

Another factor is the very clear demonstration that the uræmic individual is susceptible to bacterial toxins. In very many of these cases bacteria are present, although the usual evidence of infection may appear excluded. In the pneumonia, pericarditis, and some other complications of diabetes an infection is admittedly present; therefore the fluids of eclamptics should be studied bacteriologically for the detection of such organisms.

Dr. J. Alison Scott: From the experience I have had in the recent care of six or eight cases of cerebrospinal meningitis in the Pennsylvania Hospital I feel impressed with the fact that it must be the relief of pressure that produces amelioration of symptoms. In some eight cases of cerebrospinal meningitis the spinal canal was tapped. In three cases—deeply unconscious—the removal of an ounce or more of fluid served to produce a distinct amelioration in the stupor, and they seemed to be better for six or eight hours after withdrawal of the fluid and then relapsed. On two occasions I tried this in uræmia without any success. In one case the woman was stuporous, passing into a hemiplegic state. Within the past few days I have been trying to see the results of puncture of the spinal canal in the autopsy room, and only three days ago I had three men try lumbar puncture on a child, and each one of them not only got through the canal but withdrew blood probably from the vena cava or the abdominal aorta, and all had done lumbar puncture not infrequently before. I think there should be, especially in children, a certain amount of precaution observed not to pass the needle more than two or two and a half centimetres into the back.

Dr. J. P. Crozer Griffith: It seems to me that Dr. Willson has brought us some distinct and positive results which it would be difficult for merely negative evidence to overcome. At the same time I am not convinced that this procedure is going to do good in many cases on the theory that it relieves intracranial pressure. This is not the result of my experience in uræmia, but because I have for several years been doing lumbar puncture in children in cases of intracranial pressure depending upon inflammation of the meninges. There have been, I suppose, between fifty and one hundred cases, and, although I have seen temporary improvement, it has been of the nature Dr. Scott mentions—*i. e.*, that the child *seemed* to be better. I was only rarely able to say that the improvement was certain. There is a possibility that in some instances the inflammation had shut off the ventricles from the spinal canal, but I do not believe that this had occurred in every case, If the cerebral condition in these cases was due to pressure, surely in some. at least, we ought to have had some relief. Therefore, reasoning by analogy, it seems probable that Dr. Hughes is correct, that in the majority of cases uræmia is due to toxic action. Just as in meningitis, the majority are due to inflammatory action, and that in neither case can we expect to get very much good from mere relief of pressure. In a case in which the fontanelle bulged greatly I did lumbar puncture, and, though the pressure was relieved, the child was not a particle better, and died two weeks later.

Dr. Willson closes: Dr. Tyson has mentioned a most interesting point, fully covered in portions of my paper which were not read, whether, after all, in cases that show positive and prompt improvement after lumbar puncture, we are justified in ascribing the improvement to the relief of pressure or to the withdrawal of toxins. To prove the fact that relief of pressure is the dominant influence as far as we could, we injected small animals with the cerebrospinal fluid of uræmic cases. In no instance was there any deleterious effect upon the animal, and from the experiments carried out it would appear that the cerebrospinal fluid contains no toxic principle. Drs. Hughes and Carter showed years ago that the blood of uræmic, and even of normal subjects does contain such a toxin. It therefore seems fair to conclude that the relief of pressure in these cases alone caused relief of the symptoms. In our experiments we proved that certain cases could be promptly relieved by lumbar puncture and that certain other cases could be relieved not at all. We do not wish to make a sweeping claim for this measure that it will cure even a large percentage of uræmic cases, but that there is a certain percentage of cases that can be relieved by cerebrospinal drainage and by no other means.

I wish to say that most of this work was done in the wards of Dr. Hughes, and that it was through his courtesy that we were able to carry out our experiments. While to-night the criticism has been largely unfavorable, I

believe that it has been proven that in a percentage of cases cerebrospinal drainage is of distinct value, and that it should become part of the routine treatment of uræmia.

Dr. Tyson suggests venesection. In a large percentage of these cases venesection was attempted first, the veins collapsing as fast as they were opened. In certain cases we could not bleed from the veins, and one case we bled from a radial artery. We, however, secured our best results from those cases in which we did lumbar puncture only. Even when venesection has failed, the lumbar puncture has occasionally done positive good.

THE FAMOUS CONTROVERSY CONCERNING THE USE OF CANTHARIDES INTERNALLY.

AN HISTORIC SKETCH.[1]

By THOMAS LUTHER COLEY, A.B., M.D.

Occasional references are found in the literature to the fact that John Greenfield, a London physician, was thrown into Newgate Prison, in 1698, having been convicted of malpractice by the President and Censors of the College of Physicians for having administered cantharides internally.

The incident is unique in that Dr. Greenfield was himself a Fellow of the College and a physician of excellent standing in the community. He was a Hollander by birth, a graduate of the University of Utrecht, and before settling in London he had been appointed "by the high and mighty states of Holland" (as he himself says) Physician-in-Chief to the Garrison at Grave. In 1677 he wrote a *Treatise on Stone and Gravel*, and seems to have acquired considerable reputation as a lithotomist.

Shortly after his release from Newgate, Greenfield wrote in Latin a somewhat elaborate defense of his position, entitled, *On the Safe Use of Cantharides Internally Administered.* This work ran through several editions, both in Latin and English, between the years 1698 and 1706.

In the library of the Surgeon-General there is a copy of the first edition of the Latin work (*De Tuto Cantharidum in Medicina Uso Interno*), printed by J. Taylor, London, in 1698. In the Lewis Library of our own College there is a well-preserved copy of an

[1] Read March 1, 1905.

English translation of Greenfield's defense by Mr. John Marten, Chirurgeon. The writer also possesses a copy of the English translation.

It is interesting that there has come down to us an elaborate account of one side of this controversy, the vigorous protest of the victim that he had been convicted on grounds that were irrational, and that he was given no opportunity to refute the baseless charges.

The incident was, after all, but a tempest in a teapot compared to the important world events of the period, but it created an intense furor in medical circles of London, and throws an important light upon medical thought and practice of the time.

The tract (which forms the subject of this sketch) is one of those *apologias* which have been by no means uncommon in the history of medical literature, and which have become more and more unusual with the growth and consequent opportunities of modern medical journalism. Their avowed purpose has been controversial and their popularity and merits have varied with the abilities of their authors. We cannot but be impressed on reading these pages with the force, earnestness, and sincerity of Greenfield's words. He had suffered a humiliating and degrading experience, and his pen was steeped in the gall of bitterness which such treatment would inspire, yet he marshals numerous authorities on his side, and arraigns his accusers for their narrowness and ignorance with more grace than many would have exercised under similar circumstances.

There is no doubt an interesting history connected with this event, and a glance at the history of the period in which it occurred may enable us to conjecture that politics within the College had something to do with the drastic treatment which Dr. Greenfield received.

The Royal College of Physicians was founded in 1518, fifty-seven years after the granting of the Charter to the Barbers and Barber Surgeons by Edward IV., and thirteen years after the acknowledgment of the Wardens and Fellowship of the Craft and Mystery of Surgery as a distinct body. Four years later this Charter was confirmed by an Act of Parliament. Dr. Linacre,

the first President, was a believer in higher medical education, and his influence was so lasting that in the year 1674 Charles II. was induced to send a mandate to the College ordering that no person should be admitted as a Fellow who had not been graduated from Oxford or Cambridge, a fact to which is attributed the high social position and the erudition of the Fellows of the College.

John Greenfield graduated from the University of Utrecht in 1670 and was a successful practitioner in London. In 1683, despite the fact that he was not a graduate of Oxford or Cambridge, he was admitted to Fellowship in the College. We may surmise that this was not without opposition and have had bearing upon subsequent events.

Greenfield's unhappy plight occurred, as we have said, in 1698. At this time King William was on the throne; the Bank of England was a lusty infant institution of four years. Sir Thomas Browne, who had discovered adipocere, and who always, as he tells us, carried a piece around with him, had laid aside forever his earthy toils in the quiet old town of Norwich, just sixteen years before. Sir Isaac Newton had been for three years Warden of the Mint, and John Locke, after his long sojourn abroad, was spending the glorious evening of his days in London approaching three score years and ten. Penn's thriving colony in Sylvania had been established sixteen years. John Dryden had just brought forth the famous second song for St. Cecilia's Day, and had two more years of brilliant career before him.

A few months after John Greenfield's release from Newgate appeared his Latin work on the *Safe Internal Use of Cantharides*. In 1706 this work was translated into English with the full approbation of Dr. Greenfield by John Marten, Chirurgeon. It is a copy of this work we have before us. The translator eulogizes Dr. Greenfield in his preface, and there follows a laudatory poem, "In Praise of the Learned Dr. John Greenfield, Member of the College of Physicians in London, the AUTHOR, and the Ingenious Mr. John Marten, Chirurgeon, the TRANSLATOR of the Book, Entitled *A Treatise of the Safe Internal Use of Cantharides in the Practice of Physick*." In this poem Dr. Greenfield is pictured as a seeker

for the hidden depths in the rich mine of Nature, and his envious Fellows of the College are depicted as a pack of dogs, dazzled by envy and in the undiscerning light of their folly, who in full cry drive fair-hunted virtue to bay. The three concluding stanzas of the poem are interesting, in the fact that they illustrate the height of this verse-maker's fancy, as well as showing us how self-complacent a gentleman Mr. Marten must have been to have permitted the insertion in his own work of these commendatory verses:

"Greenfield thus Conqu'ring in so just a Cause
Like Caesar his own Commentaries draws,
But, oh! to make that Greenfield-Labour shine,
Marten, that generous Work of Glory's thine;
By a warm Patriot Zeal thy Breast inspir'd,
Thy Country's Universal service fir'd,
Thou, the true great Lucina to this Birth,
T' a wider Orb of Light Bringst the fair Product forth.

"Before the Jewel in the Casket lay,
And only Letter'd Trustees kept the Key;
Thou Kinder Marten with a publick Smile,
Dole'st the Rich Blessing round the Spacious Isle,
To every eye dost the vast Mine unfold,
Let'st in all Gazers to the Bed of Gold.
Greenfield the Learn'd, but thine the bounteous Hand,
A grateful Nation does thy Debtor stand.

"Thus, like a Marlborough, in this great Cause,
Thou drawst thy pen, as his kind Sword he draws:
That aiding Hand the Champion Marten brings,
As has new plum'd the shorter Greenfield's Wings,
To a more narrow Circle bound before,
Thou'st taught his German Eagle how to soar."

Greenfield dedicates his work to William, Earl of Portland, with whose brother-in-law he sets himself forth to be a fellow-student and countryman. He recites in this dedication the story of his own with the fervent pen of a man who has been wronged. A portion of this dedication is worthy of repetition.

"Both the Author and this little Treatise most humbly beg your Lordship's Patronage, but more especially the former, as coming

out of the midst of a Den of Thieves, a gang of Rogues, Villains and Parricides, and even out of the most notorious, the most infamous Gaol for Rogues and Villains of all sorts in the whole Kingdom, NEWGATE, yet Innocent, and by no means conscious of Guilt, and therefore does not beg your Lordship's intercession for a Reprieve from the Gallows, or a Pardon for any Crime; for the Amnesty granted by his most excellent Majesty, by, and with the consent of the whole Kingdom, which indeed might and ought to have availed a real Convict, or one Condemn'd to suffer Death, could be of no effect to the Innocent; a horrible Crime indeed, not easily to be expiated, that I should Prepare, Correct, and Administer with so great Success, a Medicine in Practice for so many ages past, approv'd and ratified by the Authority of the most celebrated Physicians, and by me published as an Arcanum Dignissimum & Laudabile. I am convict only upon the Railery or Clamour of 3 old Women on the most abstruse Practice of Physick; and condemned without being so much as heard, or any Witnesses examined, and Sentenced to perpetual Imprisonment, had their Wills past for Law; but lo, the sacred Authority of our Constitution steps in, and by unanimous Vote, my Jury who were my Judges, discharge the Innocent without Bail or Main-prise.

"What their Reason was I know not, the most inveterate Enemies could not have done more, had they been implacable to a Foreigner, hateful to a Hollander, and resolv'd utterly to destroy a Man void of all Help, Patronage, or Protection, together with his Wife, Children and Family."

In this dedication Greenfield refers to the fact that twenty-five years before he had been appointed by the then Prince of Orange, Physician-in-Chief to the Garrison of the city of Grave, and he adds: "The so many Calumnies cast upon me on every side, force me even to have recourse to my own Testimonies, to support my Reputation, not but that I strongly hope I have still many that can, and Alacriously will vindicate my Fame, and even the Native English Virtue, Faith and Justice were sufficient to protect me, against the Rancour and Malice of my Enemies."

Having presented this dedication to the Earl of Portland, there

is a second dedication to Sir Richard Blackmore, Doctor Francis Bernard, and Doctor William Gibbon, whom Greenfield addresses as the most celebrated Practitioners of Physick in London. These men were his sturdy supporters throughout his difficulty. Dr. B. Mandeville contributes a glowing tribute in Latin verse, "Upon the Author, Treating of the Internal Use of Cantharides." There also follows a translation of this poem. In this we read:

> "Now let the Sick-bed Sighs and Fears retire,
> And that great Name their whole cheer'd Veins inspire.
> Greenfield, a Name that all Learn'd Tongues must Chant."

In 1698 the College of Physicians was housed in Warwick Lane near Newgate Street. This site was not far from that Panyer Alley in which is the famous old tablet containing the figure of a boy sitting on something (says a squeamish writer), which may be described as a pannier. This is the inscription beneath:

> "When ye have sought the city round,
> Yet still this is the highest ground.
> August 27th, 1688."

The history of Greenfield's trial and conviction may be learned from the extended preface of his apologia. It seems that in 1692 he treated a woman suffering from ulcer of the bladder with cantharides "corrected with camphor." The patient disobeyed orders and took cantharides alone, in consequence of which she was ill for some time; finally, however, recovered and was in better health than before. Greenfield was summoned to appear before the President and Censors at this time, but was exonerated; one of the body warmly championing his defense, Dr. Josias Clerk.

However, in 1698, "the bitterness of gall appeared and speedy vengeance was designed, occasioned," says the author, "by some sharp words that had passed between himself and Richard Torleffe, one of the Censors."

It is unquestionably to this, now almost forgotten worthy, that we owe the whole circumstances.

Greenfield having continued his practice of prescribing cantharides, always carefully corrected with camphor, was again summoned before the august body and offered his previous defense; further, desiring to experiment upon two dogs in the presence of the President, Sir Thomas Millington, Knight, and the Censors. To one of the dogs cantharides alone was given; to the other cantharides to which camphor had been added. He further offered to produce witnesses, in cured patients and fellow-practitioners, but was not permitted to do so. "It was preaching to a dead Wall," says the author, "all was to no purpose, they refuse, reject, and disdain all that could be offered in my defense.

"And since no reason could be brought,
With private Fraud they make it out."

"For they gave a particular and pleasing Attention and Credit to the Railings and Calumnies of three Women, Sworn clandestinally and privately in my absence, and deny'd me the liberty to hear their examination, or to make any reply thereto, tho' often requested, but sent me away wholly Ignorant of what was done."

"But about 14 Days after, committed me to NEWGATE, the Gaol for THIEVES and ROGUES by VIRTUE of a certain WARRENT under their HANDS and SEALS, charging me guilty of MALE PRACTICE.

"Lo, this is the truth of the Matter!" exclaims Greenfield. And in view of all that can be learned to the contrary it would appear that the treatment to which he was subjected was unduly harsh, and savored of the star chamber.

"Must none but 3 or 4 judge of the MEDICINAL ART?" exclaims Greenfield, "certainly not, unless such would be accounted Omnificient or Infallible. Remedies may be administered which they understand not, since many things are daily found out by the curious Enquirers into Nature, for the benefit of Mankind, which was condemn'd as hurtful by the ANTIENTS."

Here is a paragraph which will interest those who hold the bath treatment to be modern.

"For what," says Greenfield, "if a Physician should in the middle of Winter take a Patient out of his warm Bed, who is Sick

of a Palsye or other Disease of the Limbs, and immerge him in cold Water (rendered yet more cold with the dissolution of Nitre), would they not call this Mal-Practice? But let them have a care of that, for it is evident the most Learn'd and Skilful Practitioner, Dr. Edward Baynard, hath by this means restor'd several, who are still alive, and in good health; the Truth of which can be attested at any time. This very Method that most Worthy Physician communicated to me, and allow'd me to assert it in his Name in my Writings."

His concluding words form an admirable exordium:

"But tho' all others should approve, yet the Censors' opinion alone must needs, it seems, remain Infallible, and must not be call'd in question, for the other Members of our College (a few of these of lesser note, who fearful of the displeasure of the Censors, only excepted) agree with me, even all the Senior and most Eminent and Noted both for Learning and Practice of our College, the Men of Honor, Candor, and true Christian Piety have Publickly, even to the Face of my Judges, espoused the cause of an injur'd Brother, and vindicated and confirm'd my Innocence from their own Experience.

"If, therefore, after all these Testimonies and Probations of the laudable and safe internal Use of Cantharides deduced from the Practice, both of the Ancient and Modern Writers, they remain stupid and obstinate, how horrible and amazing is such Ignorance?

"But supposing them conscious of these things, good God! how much greater is their Malice; I would appeal to the Throne, to the great Council of the Nation, the Parliament, the living Oracles and Founders of our Laws to be my Judges, whether it be not an unaccountable Grievance, that such Men as these under the Name of Censors, should be endu'd with such power (as they boast they have) of committing Physicians to Gaol, at their own Will and Pleasure."

The body of this work proper is composed of a miscellaneous series of cases cured or claimed to be cured by the use of cantharides, and a ponderous collection of quotations from the authorities of the past.

This was not a time when men could, like Emerson, "Skim lightly over the storehouse of the past." They turned over the ponderous books of the masters and quoted verbatim and with the credulity of unquestioned reverence, paragraphs bearing on the subject. For 1600 years Dioscorides was the authority; before the awakening of the spirit of doubt, of science taking nothing for proven. As a consequence, advances were slow, methods were at fault, not men. The blending of philosophy and astrology, and, in general, full credence in the occult arts were meshes that entangled those pursuing the vocation of medicine. It is a saving feature that occasional lightning flashes appear through the all-enveloping screen of blackness.

As to the mode of action of cantharides, this book contains earnest inquiries as to the best method of preparation of the insect; whether the head, wings, and claws should be removed before maceration, or wherein exists the potent force. One authority holds that the power of blistering resides in the innumerable prickles with which the body of the insect is covered, which affect the skin as nettles do the hand, and, therefore, it may be supposed, we are informed, that the smaller the bodies of the cantharides are bruised or beaten before they are applied to the skin, the longer before they operate or raise a blister, by reason, their stings are too much broken in bruising. It is seriously advanced that the effect on the bladder is induced by the prickles of the insect being carried through the serum of the blister to the bladder, "which, being more tender and less distended with native mucus than other parts of the body, is stung, as it were."

The most learned and ingenious physician, Dr. William Cockburn, of the College of Physicians, is quoted to this effect as to the operation of a blister. He had employed microscopes to look on the fly in his effort to discover any sharp instruments, swords, daggers, or the like sort of armature in these warlike and wounding creatures. "The fly," he says, "became very delightful, but too large a survey for me, and the powder begot nothing for my sight but a dark cloud." He, therefore, retired to his laboratory and placed a half-pound of cantharides in a retort, when, on application

of the slightest sand heat, there arose innumerous quantities of bodies, which are the wounding powers of the insect.

As to the camphor, there are given numbers of references as to its nature, source, and qualities. "Whether camphor be hot or cold, is not to the present business," says the author. He quotes merely the virtues which have been demonstrated by his own experience.

The following lucid description is given: "Camphor is in its own nature wonderful, and its virtues are against diseases in any part of the body, like a panacea." "Camphor opens, penetrates, attenuates, digests, and promotes insensible transpiration, and, upon the account of its subtle particles, mixed with proper medicines, removes (nothing more) the most intense, vehement, and extreme pains."

In discussing the value of a vesicatory in the treatment of gout, the use of the moxa is regarded as similar, and the description of Sir William Temple's experiments with the moxa on himself is given in full. Sir William, it will be recalled, was Dean Swift's patron and a brilliant diplomat and literateur, and the master of an excellent prose style. He died in the very year of this incident.

Boyle, the physicist, and Sir Thomas Browne are also called upon to support, in part, the author's views.

Dr. Francis Bernard, who was a supporter of Greenfield, died shortly afterward, and the author indulges in this quaint conceit of his friend. "This great Man did behave himself very Candidly and Learnedly (as other worthy Physicians did with him whose Names are expressed in this Treatise); he died as mentioned before, and that his Name may live forever, I made the following Verses on his Memory, which I have taken care should be Printed in this Treatise." (The verses follow.)

The use of cantharides in medicine would form the fruitful source of an interesting study; such is, however, not within my province in this paper. I am not concerned with the merits of this particular controversy.

Upon the authority of Hippocrates and hosts of his followers it was employed internally for dropsy, apoplexy, and jaundice. In

the course of time it lost favor, and at the time of Greenfield was but seldom employed.

In the sixth edition of the *London Dispensatory* of 1659 no mention is made of its use, and in a very rare work on *Renal Diseases*, by D. Petro Foresto, 1596, from the Plantan press, the use of cantharides is not mentioned. Werthoff employed it in 1733, but its advocates have been few and far between.

John Eberle, of this city, writing in 1824, highly extols the use of cantharides in dysmenorrhœa, incontinence, cystitis, gleet, impotency, dropsy, with languid circulation, etc. He quotes a Dr. Hosack in stating that Dr. Francis, of New York, was the first to suggest its use in this country.

As to the use of camphor, to no single drug has been ascribed such contrary properties in our empiric literature. It has been claimed that instead of attenuating the action of cantharides, strangury has resulted from the use of camphor alone.

THE GARDENER'S SPADE DEFORMITY AND THE SILVER FORK DEFORMITY IN FRACTURES OF THE CARPAL END OF THE RADIUS.[1]

By JOHN B. ROBERTS, M.D.

Much has been written in recent years about the pathology and treatment of fractures of the carpal end of the radius. These lesions continue, nevertheless, to be badly treated by a great number of practitioners. It seems impossible to convince the profession that restitution of the normal concavity of the palmar surface of the lower portion of the radius is essential for comfortable convalescence and perfect cure. This must be accomplished, even if great force is required to disentangle the fragments and thrust the lower piece into its normal relation with the upper. Such force is demanded in most cases, and the surgeon who fails to employ it does not reduce the fracture. Pain, stiffness of the wrist and fingers, deformity, and a protracted convalescence result from the defective surgical treatment.

These injuries are the fractures of all others in which "setting" of the bone must be promptly and efficiently done by the immediate application of a very considerable degree of manual power. Ignorance of the anatomical shape of the lower third of the bone and timidity in using sufficient force are the chief factors in the imperfect surgical treatment.

The so-called "silver fork deformity" of the fracture, with displacement of the carpal fragment backward, must be absolutely overcome before the fragments may be assumed to have been properly coapted. Very often do I see cases in which the

[1] Read March 1, 1905.

reduction has been only partially successful, because sufficient force has not been applied. The fracture in the same part of the radius with displacement in the opposite direction, namely, forward, is frequently unrecognized, and, therefore, remains un-

FIG. 1

Deformity in fracture with backward displacement.

reduced. This injury is much less frequent than that in which the lower fragment is thrust toward the dorsal aspect of the forearm. It, however, occurs sufficiently often to be taken into consideration in the diagnostic examination of all injuries near the wrist-joint.

FIG. 2

Deformity in fracture with forward displacement. (Cast from Beatson's case.)

It is undoubtedly often overlooked; probably because the lower fragment, driven forward, lies between the flexor tendons and the concave palmar surface of the radius. Little protuberance is therefore made by the displaced piece of bone, which simply fills up, as it were, the hollow of the radius above the carpus.

The general deformity which I call in teaching the "gardener's spade deformity," is, however, very characteristic, even when the inflammatory swelling of the forearm and hand is great. It is very different from the "silver fork deformity" of the fracture with backward displacement of the carpal piece. As will be seen by these photographs and casts, from the Mütter Museum, the planes of the forearm and hand are related to each other almost exactly as are the planes of the handle and blade of the gardener's spade. This deformity is not at all like the silver fork contour given by the fracture with backward displacement, which has a marked elevation at the back of the forearm, due to the displaced lower fragment. That elevation is conspicuous, because the dorsal surface of the normal radius is practically level. It has no hollow as has the palmar surface.

FIG. 3

Diagram of gardener's spade deformity in forward displacement.

Diagram of silver fork deformity in backward displacement.

Both fractures are produced usually by falls, in which the force of the impact is conveyed to the lower end of the radius. Whether the lower fragment is thrust backward, as it is usually, or forward, as it is occasionally, depends upon the resultant of the forces.

The degree of displacement dorsad or palmad of the carpal piece varies with the amount of the vulnerating force and the strength of the bone. Therefore, the degree of resemblance to the gardener's spade or the silver fork also varies; but it is very marked in both instances when the lower fragment is markedly thrust out of place.

In both lesions the styloid process of the radius is apt to be carried upward toward the elbow. As a result, an imaginary line joining the ulnar and radial styloid processes crosses the axis of the forearm at nearly a right angle or with the radial end nearer the elbow than the ulnar end. In the normal arm this interstyloid line is farther from the elbow on the radial than on the ulnar side. The width of the forearm just above the wrist-joint is apt to be increased in these fractures, because of the displacement toward the elbow of the radial side of the carpal fragment. The hand, on account of the change in the plane of the articular surface of the base, may be voluntarily carried farther to the radial side than normally. The ulnar head is very prominent at the back of the wrist in fracture with forward displacement, but not so in the break with backward displacement. In both forms of injury, however, the ulnar head may be very prominent at the ulnar *edge* of the wrist, because the shortening of the broken radius may give a displacement of the hand and carpus toward the radial side of the limb.

Examination with the *x*-ray will often aid in the diagnosis, though usually it is not needed, if the examiner knows the anatomy of the parts and is familiar with the symptoms of both forms of fracture. It must be remembered, too, that the *x*-ray picture is, after all, only a diagrammatic outline of the varying densities and consequent shadows. The tube placed over the dorsum may give very nearly identical results on the photographic plate in fracture with the carpal piece displaced either backward or forward. A second skiagraph should be taken through the forearm with the ulnar edge toward the photographic plate. This is illustrated by a skiagraph here exhibited, which was not understood by the doctors who first saw it and the injury. The examination of the wrist some weeks after injury made it clear to me that the case had been a fracture with forward displacement which had not been recognized, and therefore was not reduced. The skiagraph shows well the displacement upward of the radial styloid process, but does not show in which direction the lower fragment was thrust. The gardener's spade deformity and palpation of the

wrist on the palmar aspect definitely proved to me the character of the bony lesion.

The treatment of both fractures is easy, if the doctor will only use enough force to disentangle the carpal end and compel it to assume its normal position. This forcible reduction is essential. A light, straight splint on the dorsum of the forearm and hand, or a convex splint on the palmar surface is usually the proper retentive dressing after reduction has been thoroughly accomplished. The concave palmar surface of the lower third of the radius must be maintained after forcible reduction has re-established it. Plastic splints are probably preferable to wooden ones; though wood, metal, gypsum, or adhesive plaster all make good retentive appliances, if the fracture be thoroughly reduced and the professional attendant is discreet in the selection and application of his splint material. The simpler the dressing the better, as a rule.

DISCUSSION.

Dr. Frank Woodbury: The subject is important because every physician is liable to be called upon to treat this fracture, and the correct principles of treatment are not generally understood. Dr. Roberts has not spoken of the degree of injury to the bones, which may affect the prognosis. The lower fragment may be broken in several fragments, so as to interfere to a certain degree with the exact replacement, and some deformity will naturally result. Again, there may be synovitis, with adhesions and limitation of motion; in fact, no one can predicate positively in individual cases what the result will be, or give assurance of a perfect cure without deformity; but the treatment recommended by the lecturer will undoubtedly yield the best results possible in any given case.

I want to call particular attention to the recommendation given by the late Dr. Thomas G. Morton of the frequent examination of fractures, and especially of these fractures of the radius, and the application of hot douching and soap and water followed by alcohol and massage, in order to restore healthy circulation and nerve-tone, and to watch the progress of the fracture toward healing. After a few days have elapsed, and before any amount of callus is thrown out, and when the ends of the bone are softened, by gentle manipulation and compression we can overcome the deformity. At this time, when the first inflammatory condition has subsided, we can see exactly

what we are doing. As a rule, however, the correctness of the advice to produce early reposition of the fragments cannot be disputed. In carrying out the treatment the light moulded metallic splint introduced by Dr. Levis is probably the most satisfactory apparatus, especially for the silver fork deformity, which, by holding of the hand in a position of moderate flexion, aids in restoring the curvature of the lower end of the radius. In several of these cases which I have treated I have not always succeeded in reducing the fracture completely at the beginning, but have relied upon the later manipulation, and have succeeded in moulding the fragments into position with satisfactory results. As I said at the beginning, a perfect result cannot be assured. The surgeon cannot be held responsible for a perfect result in all cases of fractured radius, because it is not known how much inflammation there will be in the grooves through which the tendons run, which may give adhesions and hinder motion of fingers and wrist, and some deformity may result from comminution of the lower fragment, resulting in imperfect apposition.

THE DIAGNOSIS OF THE SIZE, FORM, POSITION, AND MOTILITY OF THE STOMACH AND BOWEL BY MEANS OF THE X-RAY.[1]

By G. E. PFAHLER, M.D.

In 1903, Cannon[2] made some interesting observations upon the "Mechanics of Digestion" by means of the *x*-ray. In his observations he used pellets of bismuth mixed with food, and watched their movements through the stomach and intestines of cats, dogs, rats, and guinea-pigs, and even in man.

He determined that the stomach divided itself about midway into two portions, the cardiac and pylorie, and that the peristaltic waves were to be seen entirely in the pyloric half, the cardiac half serving as a reservoir. He also determined that the carbohydrates pass more rapidly from the stomach than the proteid food.

In the ascending and transverse colon he found antiperistaltic waves which moved backward toward the cæcum. The peristaltic waves in the stomach occurred at the rate of 6 to 7 a minute, while in the colon they occurred every 15 to 20 minutes.

Tousey[3] used the *x*-ray to excite fluorescent substances, such as fluorescine, or quinine bisulphate, and by this means outlined the stomach.

Prof. H. Rieder, of Munich,[4] seems to have been the first to make practical use of the *x*-ray in the clinical diagnosis of condi-

[1] Read May 3, 1905.

[2] Observations on the Mechanics of Digestion. Journal of the American Medical Association, March 21, 1903.

[3] The Relation of the *x*-Ray and Radioactive Solutions to the Examination of the Stomach. New York Medical Journal, May 21, 1904.

[4] Contribution to the Topography of the Gastrointestinal Canal in the Living Man, together with Investigations Concerning the Duration of the Process of Digestion. Fortschritte auf dem Gebeite der Roentgenstrahlen, February 14, 1905.

tions of the stomach and bowel. He has recently published a valuable series of observations as to the position, size, form, and motility of the stomach and bowel, as studied by the *x*-ray, in the living subject.

To accomplish this he used about an ounce of bismuth subnitrate mixed with as much milk or other food as the patient could conveniently take. He then made a series of skiagraphs, the first being made immediately after taking the food, and the others at definite intervals to determine the rate at which the food passed through the stomach and bowel.

The examinations were made with the patient in the standing or sitting posture, the tube 60 cm. from the plate, and the anode opposite the umbilicus. The exposures were made in a few seconds.

The position of these organs has often been determined by anatomical investigations, but such investigations in the living subject were difficult or impossible before the advent of the *x*-ray.

Briefly he determined the following points:

1. That the size, form, position, and motility of the stomach were in great part influenced by its being empty, partly filled, or overfilled, also by the contractions of the stomach.

2. When the stomach is filled it extends entirely to the left of the median line, except possibly the pylorus, which may extend to the right.

3. The position of the stomach is vertical, or at least diagonal instead of horizontal, as is usually stated in text-books.

4. Bismuth nutriment is seen to begin passing the pylorus soon after it is ingested.

5. The size is influenced by the age, contents of the stomach, individuality, and pathological lesions.

6. The stomach is longer and more vertical in women than in men.

7. When bismuth enemata are given no difference in position of the colon is shown from that shown when the bismuth is given by mouth.

FIG. 1.[1]

Recumbent posture; plate posterior; tube eighteen inches distant; exposure fifteen seconds. 1. A cent on the umbilicus. 2. The stomach. 3. The right sacroiliac synchondrosis. 4. The cæcum. 5. Descending colon. 6 and 7. Heads of femora.

[1] The illustrations in this paper are used by the courtesy of the Archives of Physiological Therapy.

Fig. 2.

Erect posture: plate posterior, made immediately after taking the food. 1. A cent on the umbilicus indicating the position of the tube. 2. The stomach in the pelvis. 3. Sacroiliac synchondrosis. 4. Cæcum, empty. 5. Descending colon, empty. 6 and 7. Heads of the femora.

FIG. 3.

Erect posture, six hours after taking the food, half of the food still in the stomach. 1. Cent on the umbilicus. 2. Stomach. 3. Sacroiliac synchondrosis. 4. Cæcum, empty. 5. Descending colon, empty. 6 and 7. Heads of femora. 8. Transverse colon, empty. 9. Shadows of food in the small intestines.

Fig. 4.

Position, etc., as in Fig. 2. 1. Umbilicus. 2. Transverse colon. 3. Right sacroiliac synchondrosis. 4. Cæcum and ascending colon, showing the food after twenty-four hours. 5. Isolated masses of the food in the small intestines. 6. Descending colon, empty. 7 and 8. Heads of femora. Technique same as with foregoing.

Fig. 5.

Position, etc., as in Fig. 2. 1. Umbilicus. 2. Cæcum and ascending colon, empty. 3. Transverse colon. 4. Descending colon, empty. 5. Remains of the food in the rectum, after forty-eight hours. 6. Right sacroiliac synchondrosis. Technique same as with foregoing.

8. Fluids pass more quickly from the stomach than solid foods. 500 c.c. of water leaves the stomach in from one-half to three-quarters of an hour. Beer leaves more slowly. The motility was found to be the same for proteids and carbohydrates, but fats left the stomach more slowly. The presence of bismuth has no influence upon the rate at which the food leaves the stomach.

9. Normally bismuth food leaves the stomach in from three to six hours. In twelve hours part of it is found in the cæcum, and in from forty-eight to sixty hours it has passed from the rectum. The bismuth causes obstipation in the large bowel.

10. The method can be applied to all patients who can take food. When food cannot be taken by mouth, the method can be applied to determine the size and position of the colon by giving enemata.

The case forming the basis of my report was Mrs. J. D., aged thirty-eight years, married. She has had three children. One year ago she had influenza, followed by a cough which has practically disappeared. Her present symptoms came on gradually and consist of anorexia, nausea, loss of weight, constipation, loss of sleep, and marked general prostration.

Physical examination showed some signs of tuberculosis at both apices, and especially at the right, but the disease seemed to be in a quiescent stage.

The abdomen is somewhat emaciated and the lower portion slightly pendulous.

The case seemed to be a favorable one upon which to test the value of the *x*-ray in the diagnosis of the size, form, position, and motility of the stomach and bowel. In order to eliminate confusing shadows I ordered a purge at 8 P.M., which cleared the bowel of fecal matter. The patient was given milk for breakfast. At noon I gave her twenty ounces of milk mixed with an ounce of bismuth subnitrate. I requested her to drink all that she could without making her too uncomfortable. In this way we obtain a fair idea of the size of the stomach.

Immediately after taking the food I made a skiagraph (Fig. 1) with the patient lying upon her back. Rieder seems to have

made all of his skiagraphs with the patient in the sitting or standing position. By omitting the skiagraph in the supine position we lose a valuable point of information, namely, the mobility of the stomach, as is clearly shown in this case. In the supine position the stomach is seen to be cylindrical in form and almost vertical in position, with the pylorus on a level with the brim of the pelvis or about two and one-half inches below the umbilicus, and the pylorus seems to be curved upward.

A second skiagraph (Fig. 2) was then taken with the patient in the standing position. This negative shows the shape of the stomach to be that which is usually described in text-books, and it seems to be normal in size, but the entire stomach is resting at the brim of the pelvis. Normally by this method the central portion of the pyloric end of the stomach is found to rest on a level with the umbilicus. We have, therefore, determined that the stomach is distinctly movable and that it is displaced downward.

Rieder determined that food passes normally from the stomach in from three to six hours. Therefore, after six hours I made a third skiagraph (Fig. 3), which showed about half of the food still remaining in the stomach. This proves that there is an abnormal delay in the passage of food from the stomach of this patient, and since there is no dilatation, we have a right to conclude that the delay is not due to obstruction, but to a lack of motility.

A fourth negative (Fig. 4) was made after twelve hours, which shows the stomach to be empty, and about half of the nutriment is in the cæcum. The remainder is irregularly scattered through the pelvis and is evidently in the small intestines. Therefore, the food moves at the normal rate through the small intestines. This negative also shows the transverse and the descending colon. The transverse colon is displaced downward, and is on a level with the brim of the pelvis.

A fifth negative (Fig. 5), made after forty-eight hours, shows the large bowel to be practically empty, except in the region of the rectum, where a few shadows can be seen. The folds of the large bowel in the region of the cæcum are clearly shown, which

is probably due to the deposit on the walls of the bowel. Therefore, there has been no delay in the passage of the food through the large bowel, and the only point of delay throughout the entire gastrointestinal tract has been in the stomach.

In short, we are dealing with a case of marked gastroptosis and lack of gastric motility, and also with a freely movable stomach.

Many men have tried heretofore to demonstrate these conditions. I among the rest have made several attempts, with little or no success. We failed for at least two reasons. In the first place we used too small a quantity of bismuth. I tried to accomplish results by using from 20 to 30 grains, which now seems ridiculous. In the second place, in order to obtain good results, the negative must be made in a few seconds, or while the patient holds his breath. The negatives in this case were made in fifteen seconds each. This is necessary to obtain clear and definite shadows. Heretofore our technique and instruments did not enable us to make such short exposures of the abdomen.

This method offers distinct advantages over the older methods. It is more accurate. It makes a permanent record. It is without danger. It causes no pain or inconvenience to the patient, except the inconvenience of coming for examination at stated intervals. It can be applied, therefore, to any patient who can take food. It determines the motility and mobility of the stomach and the position of the transverse colon, which are points not determined by other methods.

It also has disadvantages. It is expensive. It requires from fifteen to eighteen hours of hard work. It is difficult or almost impossible in stout subjects. This last objection is not a serious one because we usually have emaciation in the patient in whose case this examination is indicated. The older methods of passing sounds or inflating the stomach with gas are not without danger, especially in gastric ulcer or cancer.

On the whole, I believe the advantages far outweigh the disadvantages, and that it is a valuable additional method of examination.

DISCUSSION.

J. Dutton Steele: I have been much interested in Dr. Pfahler's paper, particularly as I have had the opportunity of examining a good many cases of gastroptosis by the older methods of diagnosis. I am certain that the procedure employed by Dr. Pfahler is the most accurate one, and indeed the only one of our methods of diagnosis that gives an absolutely accurate diagram of the position of the stomach in its relation to the anterior abdominal wall. In inflation of the organ, probably the next most reliable of the methods in general use, the position of the stomach is changed by its distention with air, which causes its greater curvature to roll upward and outward, so that the portion of the organ presenting against the anterior abdominal wall is not the anterior surface, but the greater curvature and inferior surface.

There is one feature of Dr. Pfahler's demonstration to which I wish to call attention. If he has interpreted the picture rightly, then he has demonstrated a very rare condition, namely: displacement of the cardiac end as well as the pylorus, or a descent of the stomach *in toto*. The cardiac end is firmly bound to the diaphragm by short, stout ligaments, and it is difficult to see how it could descend unless it brought the diaphragm with it, whereas the ligaments of the pyloric end are weak and easily stretched, so that the pylorus can very easily be displaced. This displacement of the pylorus is the type of gastroptosis most often seen, but such a high authority as Riegel said that he never saw a displacement of the cardiac end and descent *in toto*. This has been my experience in a series of some 150 cases of gastroptosis.

I would suggest in the case under discussion that there was considerable dilatation as well as displacement, so that when the patient stood up the milk and bismuth ran down into the most dependent portion of the stomach, probably the pyloric portion, and that the cardiac end and lesser curvature do not show in this radiograph at all. If they did I believe we would see that the cardiac end had not descended below the costal margin.

Dr. James Tyson: I have little practical knowledge of the subject, but I feel that such an important and exceedingly valuable paper should not be allowed to pass without comment. I have been much impressed with the demonstrations which Dr. Pfahler has made and the satisfactory character of them. Skiagraphs have been to me for the most part unsatisfactory, but in these it is very easy to see all that Dr. Pfahler points out, and I think we are indebted to him for the successful demonstration. It is proved most conclusively in this case that there has been ptosis of the stomach, and the two positions of the stomach assumed in the recumbent and vertical positions are admirably well shown in the skiagraphs.

Dr. G. G. Davis: The question of the vertical position of the stomach seems to be often alluded to in the present literature. I cannot believe that the normal position of the stomach is to any great extent a vertical one. When we consider that the cardiac end of the stomach is situated in the seventh costal cartilage, an inch to the left of the sternum, and the pyloric end approximately opposite the eighth costal cartilage, not more than one-half way between the ensiform cartilage and the umbilicus, one sees that the difference in elevation between these two would not be more than two and a half or three inches. If the stomach then becomes dilated, it is, as Dr. Steele has said, rotated on itself, and its inferior surface becomes anterior. If the shadows as shown by the skiagraphs are low, it demonstrates an abnormal stomach. I cannot conceive of a normal stomach showing so low in a vertical direction, because the general direction of the stomach is an oblique one from before backward and from below upward, and it is only by the stretching of the gastrohepatic omentum, together with the dilatation of the stomach, that we get these shadows so low.

Dr. J. M. Anders: The use of the *x*-ray for examining the position, size, and anatomical relations and motility of the stomach and intestines is yet in its infancy. On the other hand, as we all know, that in intrathoracic conditions, more especially pleurisy, pulmonary tuberculosis, thoracic aneurysms, and many other conditions, more reliable information is given by the *x*-ray than by the physical signs. It would not be a matter of surprise to me if the same position were in the near future a tenable one with respect of the use of the *x*-ray in intra-abdominal conditions. It is clear from what Dr. Pfahler has told me about the work on the case which forms the basis of his remarks to-night, however, that the method is as yet difficult of application. It requires the expenditure of much time, money, and hard work. On account of these facts the possibility of its being generally adopted is at present quite remote. I had seen the patient, had examined her, and also shown her to a class of students prior to Dr. Pfahler's investigations into the subject according to the method detailed this evening. By means of the physical signs and by artificial inflation of the stomach and colon I could quite satisfactorily demonstrate the position, size, and shape of the stomach, and, in this case, of the larger intestine; but a little later, when Dr. Pfahler had concluded his examinations in the case and had shown the results to the same class, I must confess that it proved a greater success than my own demonstration had been. I agree with Dr. Pfahler when he states that, for the purpose of class demonstration, it is probably superior to the observation of the physical signs, or even to artificial inflation. I am sure this is true with reference to the colon. As we are probably all aware, it is at times particularly difficult to indicate precisely the position, size, and anatomical relations of the colon by means of the physical signs. The same is true with

reference to the artificial inflation of the colon. I think this method of examining for the size, position, and motility of these organs is of great value, because it forms a permanent record of the cases, and by comparison we can note changes, the result of surgical or medical treatment. Dr. Rieder, in a previous paper, has shown the normal motility of the stomach and intestines. Keeping this before us as a standard, it seems to me that an expert like Dr. Pfahler could readily estimate the varying degrees of insufficient motility as found in different pathological states. The methods at present in vogue to ascertain motility are unsatisfactory and unreliable; therefore, anything that promises greater accuracy of results, as do the investigations which Dr. Pfahler has been making, should meet with a hearty welcome.

Finally, I would say that further investigations on the same line as that pursued by Dr. Rieder and Dr. Pfahler must be made before we can draw final conclusions with reference to the matter.

Dr. Pfahler closes: I simply want to answer Dr. Steele's suggestion relative to the dilatation of the stomach. I said that it was not dilated, but after thinking over what he has said I am inclined to think that possibly it was dilated. I have come to that conclusion by two facts which escaped me at the time. In the first place, the skiagraph showing the stomach in the recumbent position shows the stomach larger than it is in the standing posture, almost twice the size. A further evidence that the stomach was enlarged is that one of the plates shows a cord-like shadow extending up into the line of the stomach. I cannot account for the cord-like shadow unless it be the collapsed wall of the stomach. The shadow widens and at another point it again spreads. However, we see distinctly the cardiac extremity of the stomach outlined down in the pelvis in the negative made in the standing posture. This is against dilatation and in favor of a complete displacement of the stomach, the cardiac, as well as the pylorie extremity, and therefore probably an unusual condition.

SOME PERSONAL RECOLLECTIONS OF THE CIVIL WAR.[1]

By S. WEIR MITCHELL, M.D., LL.D.,
CORRESPONDING HONORARY MEMBER OF THE FRENCH ACADEMY OF MEDICINE.

The story of the part played in the Civil War by our profession is nowhere told in a satisfactory manner. Histories of regiments, war biographies from private to general, the countless volumes of the rebellion record, relate the tale of battles lost or won, and of the military glory commemorated by monuments or rewarded by pensions. Except as to our technical story we alone are unrecorded.

I know of no book which tells the personal life of a war surgeon; what he did day by day on the field or in the hospital. I can imagine that such a book might be very interesting, and there are men in our own midst who could tell the story, and tell it well. It would have its romance, its pathos, its humor.

Surgeon Letterman left a volume giving an account of service with the Potomac army. It is a briefly told story of the difficulties of the army surgeon and what was required of him in the field.

There are men here to-night of whose careers as brilliant and courageous war surgeons most of you know nothing. They are quiet gentlemen who no longer talk war, and it might be well for some of you to read with what respect and admiration the surgeon-in-chief of the Potomac army speaks of the competence of William Thomson and John H. Brinton.

The other book on the history of the war is in the form of an official history of the medical department of the United States

[1] Read April 5, 1905.

Army by Harvey E. Brown, and was published by the surgeon-general's office in 1873, but has been long out of print. The portion which deals with the rebellion is not more than thirty-five or forty pages. It has the dry, technical quality of official records and does no justice to a subject which should tempt some abler pen.

When on April 12, 1861, we heard with shame and anger, such as few here can realize, that the flag had been fired on at Fort Sumter, the medical department of the army consisted of 30 surgeons and 83 assistants. Of these 24 resigned to take part in the rebellion and 3 were dismissed for disloyalty; 13 were natives of the South, but stood true to the flag. Two surgeon-generals, owing to death or resignation, succeeded one another rapidly, and finally, soon after the beginning of the war, it was found necessary, owing to age, to permit the surgeon-general, who had difficulty in fulfilling the duties of that office, to retire. He was an old army surgeon; had done excellent work, but was quite unfitted to meet the task which fell upon a totally unprepared nation. Owing largely to the great pressure made by the sanitary commission and the profession, his place was filled by lifting from the rank of an assistant surgeon Dr. William A. Hammond. He fell at once into an enormous business spreading over great spaces of country, increasing in perplexity, and making fresh demands every week, and at last so large that there was expended for ice alone in one year more than the whole amount of money which in peace sufficed for the entire medical service of the army. The organization also demanded complete revision. The surgeons of volunteers had to learn their surgery at bitter cost to many a wounded man. The regular army surgeons were little used to seeing grave wounds, and, as the surgeon-general said, there was not an aspect of his work which was not foggy with embarrassments.

Whatever else may be thought or said of William A. Hammond, nothing is more sure to me than that he duly saw and grasped a great opportunity; that he served his country as few could have done; that he created the Army Medical Museum; that he saw the

need for and advised the creation of the Army Medical School; that he pointed out the men who were to direct the Army Museum and the Army Library. Until the end of his army career he was the unfailing friend of scientific study, and created special hospitals for diseases of the heart, lungs, and neural maladies. For this latter I and others have especially to thank him, and personally I owe him thanks for chances which modified valuably my entire medical life.

The great need for medical and surgical help caused the creation of hospitals in and about our great cities. This subject might occupy an hour, but suffice it to say that there were around this city upward of 25,000 beds at one time in hospitals constructed and admirably managed by men who were in many cases fresh from civil life. As concerns this, and all other departments of the service, it may be said that at the end of the third year of the war the service had never been equalled. I doubt a little, even with what we hear now, whether it has ever yet been excelled. To take medical charge of the vast army put into the field two new grades were created, that of brigade surgeon and medical cadet. In the latter rank were Collins Warren, John Curtis, Professor Tyson, and among others my brother Edward, who died in service a victim to duty and a prey to diphtheria in the Douglass Hospital at Washington.

It became also necessary to provide additional help in the hospital service, and this was supplied by employing what were known as acting assistant surgeons. They served at home, but were liable to be called into duty in the field. Except in the case of Antietam and Gettysburg this was rare. Among these were Agnew, Gross, Morton, Stille, Da Costa, Harry Hart and many more.

Before leaving the subject of the personnel of the war I return for a moment to the service of Surgeon-General Hammond. I have spoken of his great usefulness, of his large grasp of the immense business of the war. He had, however, defects which lessened his influence. An impulsive temperament and great self-confidence led him into inconsiderate action, as when, seeing

that the Western volunteer surgeons were using mercury in excess, the surgeon-general issued an order stopping all use of calomel.

It was, of course, disobeyed or disregarded.

A word more as to the position of the army surgeon. He fired no shot, but was often forced to operate under fire, was greatly exposed, and, as statistics show, suffered seriously. I am indebted to the surgeon-general of the army for the following statement of casualties in the medical corps:

MARCH 31, 1905.

In reply to your note to the Surgeon-general, I find that of the medical officers of the Union Army during the War of Secession 41 were killed, 83 wounded, of whom 10 died: 4 died in prison, and 281 of disease incident to active service.

I regret that we have no statistics of the losses among medical officers in the Confederate Service.

Very truly yours,
J. R. KEAN.

In Brown's *Medical Notes* the matter of exchange of non-combatant officers is fairly well dealt with. It was an irregular business. In some cases they were returned, and in others were held by the enemy. Some of them were as long as a year in rebel prisons. In many cases surgeons on both sides remained with their own wounded after defeat. Toward the close of the war I am under the impression that neither side held the surgeons who thus elected to become prisoners, but there was no constant rule of action.

I remember that when I inspected Fort Delaware I found there over forty surgeons, many of whom had been classmates of my own.

My own service in the war was in the grade of contract surgeon. I was only once called into the field, and that was after the third day of the Gettysburg fight.

One of the earliest hospitals established here was in the old armory building at Sixteenth and Filbert. I there began my first hospital service with, if I remember rightly, Dr. Breed as the head of the hospital. It may amuse you to know that the

only account of that hospital is to be found in my first novel, *In War Time*.

I began here to take interest in cases of nervous diseases, which, at that time, nobody desired to keep for the reason that they were so little understood and so unsatisfactory in their results. I was therefore allowed to accept these cases from other wards, transferring in return ordinary types of disease. When this became known to the surgeon-general he was at once interested and set aside a larger ward for neural maladies. When this overflowed with cases we took over the building known as Moyamensing Hall, on Christian Street. This was opened May 5, 1862, and closed October 29, 1864. Dr. Morehouse and Dr. Keen, then acting assistant surgeons, were ordered hither, and Dr. I. P. Reese, U. S. A., was placed at the head of the hospital. It was entirely devoted to nervous diseases, and very soon also to injuries of nerves.

Again the space proving insufficient, a suburban estate on Turner's Lane was rented in August, 1862, and pavilions built for 400 men. One was assigned to Da Costa, and afforded him a chance for a classical study of exhausted hearts and for other able papers. With Drs. Morehouse, Wm. W. Keen, and Surgeon Alden, as surgeon in chief, and by a special order relieved of much of the time-killing, red-tape business, we set to work. Both Morehouse and I had at that time increasing general practice, but a morning visit to the hospital disposed of the routine work, and about 3 P.M. or later we went back. Keen, Morehouse, and I worked on at note-taking often as late as 12 or 1 at night, and when we got through walked home, talking over our cases. Usually the work took four or five hours, and we did it all in person. The late hours came two or three times a week, and usually followed an inflow of cases of injuries to nerves after some serious battle.

I have worked with many men since, but never with men who took more delight to repay opportunity with labor. The opportunity was indeed unique, and we knew it. The cases were of amazing interest. Here at one time were eighty epileptics, and every kind of nerve wound, palsies, choreas, stump disorders. I

sometimes wonder how we stood it. If urgent calls took us back into town, we returned to complete the work. In fact it was exciting in its constancy of novel interests.

Thousands of pages of notes were taken. There were many operations and frequent consultations. About midway we planned the ultimate essays which were to record our work. Of these you know. There was a small book on neural injuries full of novelty, a short essay on reflex palsies, etc. One of the most notable was Keen's essay on malingering. Others on epilepsy muscular disorders, and on acute exhaustion were never written because of accidental destruction of notes by fire. The full notes on cases of acute exhaustion would have entirely anticipated the delineation of the condition we now accept as neurasthenia. Some of our conclusions in regard to these subjects found a place in my later volume.

In this hospital massage was first used to restore action to limbs in which healing nerve wounds left the muscles palsied, or for the rigidity of splinted cases.

Here atropine was first employed hypodermically for muscular spasms, and here first the combination of atropine and morphine was used, and the results recorded in a paper. Our studies of the influence of nerve lesions on nutrition and temperature on wounds of the sympathetic and reflex palsies are now a part of common medical knowledge, but were at that time brilliantly fresh.

Added interest came from the fact that the victims were men worn out from fever, dysentery, and long marches; hence was it that some of the symptomatic expressions have never been seen since in like intensity. The chapters on the neuralgias of wounds and causalgia were received in England with sharp critical doubts as reporting cases before unheard; and so, indeed, they were. In one year 40,000 injections of morphine were used, but time lacks to describe cases of neuralgia of such intensity that the pain was increased by the vibrations of band music, the rustle of dry paper handled. I have seen men pour water into their boots to lessen the vibration which the friction in walking caused. No,

I have encountered no such cases since. And, too, we had hospital gangrene. I leave Dr. Keen to speak of this appalling ravage.

I have kept you long enough and said not half I had in mind. It would, however, be interesting to entertain you with the matter of malingering, but this, too, I leave to Dr. Keen.

I permit myself to say that a few years ago, with the utmost difficulty, Dr. John K. Mitchell re-examined all the survivors of nerve wounds whose cases were detailed in our papers or in my later work, and who could be found for personal study. This unusual and difficult task added a valuable chapter to our knowledge of nerve injuries.

When in June, 1865, our ward work was at an end, the new surgeon-general ordered that all of our notes be turned over to the department. As the unused cases were of value to us alone, we were much troubled. At once we copied or employed persons to copy this whole mass of records, thousands of pages, and within a fortnight turned over to the surgeon-general these original case-books.

Long afterward Dr. Da Costa lamented to me that he had obeyed the order, and somewhere (pigeon-holed) are many of the valuable observations of that brilliant student of disease. We were told then that we had been insubordinate, but we were out of service, and I remain pleased that for once in my life as an army surgeon I disobeyed my superior.

A word more to close this too disconnected effort to revive memories of a great contest. It were desirable that next winter we gather here some confederate surgeons to tell us the sad story of the surgery and medicine of war under less propitious circumstances.

The war so trained vast numbers of country doctors that for a long time the cases for grave operations ceased to be sent to the cities as had been usual. The constant mingling of men of high medical culture with the less educated had also value, and the general influence of the war on our art was, in this and other ways, of great service.

We had served faithfully as great a cause as earth has known. We had built novel hospitals, organized such an ambulance service as had never before been seen, contributed numberless essays on disease and wounds, and then passed again into private life, the unremembered, unrewarded servants of duty.

The history of this College is to be credited with Fellows who created, organized, and conducted the Medical Museum and Medical Library in Washington, who made the unequalled catalogue, constructed many of the great pavilion hospitals, planned and carried out the vast volumes of the medical history of the war, and who did more for the general scientific literature of the war than all the rest of the army medical service.

The total number of living Fellows of the College of Physicians on the list dated 1864 was 174. A number of these (130) were connected in one way or another with the service of the army or navy during the four years of that bloody struggle. These gentlemen were either regular surgeons, assistant surgeons, or acting assistant surgeons.

Certainly this is a record of honor of which the College may well be proud.

SURGICAL REMINISCENCES OF THE CIVIL WAR.[1]

By W. W. KEEN, M.D.,
PROFESSOR OF SURGERY, JEFFERSON MEDICAL COLLEGE.

I HAD the honor of being sworn into the service of the United States as an assistant surgeon in the shadow of the Capitol on July 4, 1861, though I had only begun the study of medicine in September, 1860, and did not graduate until March, 1862. It came about in this wise: My preceptor, Dr. John H. Brinton, had received a telegram from a former student (let us call him Smith) who had graduated in March, 1861, and was assistant surgeon of the Fifth Massachusetts, saying that he was going to leave the regiment and asking that Dr. Brinton should immediately send some one in his place, if possible. Dr. Brinton very kindly offered the place to me. I said to him, with very becoming modesty, that I hardly felt I knew enough; to which he replied, with combined frankness and flattery, by saying: "It is perfectly true that you know very little, but, on the other hand, you know a good deal more than Smith." Accordingly I entered the army and immediately went into camp in Alexandria.

From the 4th until the battle of Bull Run, Sunday, July 21, 1861, fortunately I had very little to do. The surgeon of the regiment attended the sick call, while I tried to make myself somewhat familiar with military surgery. I remember only too well, however, the trepidation with which I went to attend one member of my regiment who accidentally had shot himself through the chest. If the soldier had known how slender was my own fund of information his breast would have harbored not

[1] Read April 5, 1905.

only a serious gunshot wound, but many disturbing doubts as to the probability of his recovery in the hands of Assistant Surgeon Verdant Green.

My first initiation into real warfare was at the First Bull Run. We had marched the day before until after midnight, and were awakened after a brief sleep to the activities of a memorable day in the history of the war. It was an exceedingly hot day, and we marched and halted in the thick dust under a broiling sun until about noon, when my regiment became engaged. Up to that time, and, in fact, during the entire engagement, I never received a single order from either colonel or other officer, medical inspector, the surgeon of my regiment, or anyone else. It was like the days when there was no king in Israel, and every man did that which was right in his own eyes. I did not see the surgeon from the middle of the forenoon.

As we approached the battlefield I saw beside a little stream a few surgeons, among whom I knew one, and I asked him what I ought to do, for I was as green as the grass around me as to my duties on the field.[1] My friend Carr, of Rhode Island, suggested that I should turn in there and help, advice which I followed all the more readily because just at that time some of the advance of my own regiment appeared among the wounded. After a time I saw everybody around me packing up and leaving, and upon asking what was the reason was told that they were ordered back to Sedley Springs Church, a mile or more in the rear. Accordingly I went with them, and there in a grove alongside of the road, with no fence to enclose it, stood the little church, perhaps one hundred feet distant from the road. Both inside and outside the church much was going on. An operating table was improvised from two boards laid on two boxes in front of the pulpit. The slightly injured looked down from the gallery upon the industrious surgeons, and a number of kind women from the neighborhood helped to soothe the wounded.

[1] Surgeon W. S. King, of the regulars (Medical and Surgical History of the Rebellion, Part I., Medical Volume, Appendix, p. 2), calls attention to the fact that he and Assistant Surgeon Magruder were, with few exceptions, the only medical officers at the first battle of Bull Run who had ever served with troops in the field.

I always have remembered one little illustration of the ignorance even of brigade surgeons who had been hastily appointed at the outbreak of the war. One of the wounded required an amputation at the shoulder-joint, and the operator asked the brigade surgeon to compress the subclavian artery. This he proceeded to do by vigorous pressure applied *below* the clavicle. With a good deal of hesitation I at last timidly suggested to him that possibly compression above the clavicle would be more efficacious, when, with withering scorn, he informed me that he was pressing in the right place, as was proved by the name of the artery, which was *sub*clavian. I do not remember whether the operator took a hand in this little linguistic discussion or even overheard it. I had my rather grim revenge, happily, not to the serious disadvantage of the patient. When the operator made the internal flap the axillary artery gave one enormous jet of blood, for the subclavian persisted in running where it could be compressed above the clavicle in spite of its name. I caught the artery in the flap, as I had been taught to do by Dr. Brinton, and instantly controlled the hemorrhage.

Later I was outside the church dressing a man who had a fracture of the humerus from a Minié ball. I was applying a splint and an eight-yard bandage. We were in the wood surrounding the church, perhaps twenty feet back from the road, when suddenly one hundred or more of the soldiers rushed pell-mell down the road from the battlefield crying, "The rebs are after us!" It did not take more than one positive assertion of this kind to convince the man whose arm I was bandaging that it was time for him to leave, and he broke away from me, rushing for the more distant woods. As he ran four or five yards of the bandage unwound, and I last saw him disappearing in the distance, with this fluttering bobtail bandage flying all abroad.

My experience in this battle is a good illustration of the utter disorganization, or rather want of organization, of our entire army at the beginning of the war. It was wittily expressed in a statement which appeared in *Vanity Fair*, the *Puck* or *Life* of 1861. The editor announced that he had received from their

correspondent on the field a despatch which far surpassed that of Caesar. It stated the location of the battle, described the varying fortunes of the day, and announced the final result. Their correspondent's laconic telegram also "ran:" "Bull Run, They Run, We Run."

Later in the day the quartermaster of my regiment brought the colonel, who had been badly injured by a falling limb of a tree cut off by a solid shot. He told me that orders had been issued for the army to retreat to Washington, and I joined them, caring on the way for the colonel. Soon after the battle the time of my regiment expired, and we were mustered out of the service.[1]

I resumed my studies in September, 1861, graduated in March, 1862, and two months later entered the army by examination. Under a medical officer of the army whom I scarcely saw I was put in charge of the Eckington General Hospital, on the outskirts of Washington. Not long after taking charge, one Saturday afternoon, about 4 o'clock, I received an order to report at the office of Dr. Letterman, the Medical Director of the Army of the Potomac, in Washington. I had had so little experience in army orders that I almost trembled at the formal and peremptory character of the order. I feared that without knowing it I had done something to displease Mr. Stanton, the Secretary of War, who was a good deal of a bogy to most people at that time, for he had a way of putting them sometimes into Fort Delaware or other similar close quarters, without giving any reasons, too, which was very disagreeable.

When I reported to Dr. Letterman, however, I found that very stirring events were about to occur. He directed me to go to the Ascension Episcopal Church and the Eighth Street Methodist Church, which were just around the corner from each other, and prepare them for general hospitals; that I should find the quartermaster already there making the needful alterations, and that I was to have them ready for occupation within five days. It was

[1] For my report of the battle see "Medical and Surgical History of the War of the Rebellion," Part I., Medical Volume, Appendix, p. 9.

then about 5 o'clock on Saturday afternoon. I went to my field of duty and worked nearly all night, resuming my work very early in the morning. A gang of carpenters worked all night. At about 10 o'clock on Sunday morning the minister of the Ascension Church, who was well known for his secession views, entered the main door, his eyes wide-open with astonishment at what was going on both outside and inside of the church. Finally his inquiring gaze fell upon me, and as I was in uniform he judged that I could tell him the reason why the last pews were just disappearing under a new board floor. I answered his question by saying that the Secretary of War had taken possession of the churches of Washington and was converting them into hospitals, at which he uttered a "humph," turned on his heel, and I saw him no more. In sharp contrast was the action of the minister of the Methodist Church, who, with every member of his family, spent a large part of every day and often the entire day in the hospital ministering to the soldiers.

My assignment to this duty gave me another opportunity of learning how utterly deficient I was in training for my position. People sometimes imagine that a practising physician can be transformed into an army surgeon merely by putting a uniform on him. I was not lacking in ordinary intelligence and was willing to work, but I was utterly without training. To get those two churches ready as hospitals I had to have beds, mattresses, sheets, pillow-cases, chairs, tables, kitchen utensils, knives, forks, spoons, peppers and salts, all sorts of crockery, and the other necessities for a dining-room; all the drugs, appliances, and instruments needed for a drug-store for two hundred sick and wounded men. I needed orderlies, cooks, and the endless odds and ends of things which go to make up a well-organized hospital. I did not know how to get a single one of these requisites. As to drugs I did not know whether to order six ounces or a gallon of laudanum, an ounce or two or a pound or two of opium, and I was in utter darkness as to the mode of getting any of the other things from a teaspoon to a cook. However, I inquired, and as soon as I learned how I set myself to work. For two

nights I slept only about three hours each, and I had the satisfaction of reporting to Dr. Letterman at the end of three days, instead of five, that I was ready. On the fourth day I had one hundred wounded men in each hospital.

Happily all this is now remedied by the Army Medical School in Washington, which has been so wisely provided for training medical officers not only in post-graduate work in surgery, bacteriology, etc., but in the making out of requisitions, quartermasters' returns, the descriptive list of every patient, and all the endless, but much needed, bookkeeping of a great army. For want of such proper documentary evidence not a few deserving soldiers lack a pension, and for want of it many a scamp has obtained a pension who would never have received it had his record been accurately known. A similar medical school does the same good work for the Navy.

In August, 1862, was fought the Second Bull Run. The campaign was ushered in by Pope's famous order, dated "Headquarters in the saddle," which was wittily criticised as placing his headquarters where his hindquarters ought to be.

I was sent out from Washington to Pope's army with a large supply-train. On the way, near Fairfax Courthouse, we met General Phil Kearney with a squadron of cavalry. He fell in with the enemy within ten minutes after he passed us at a gallop and received a mortal wound. My supply-train was shelled for a short time from a parallel road at some distance to the north of us by a Confederate battery, which seemed to me odd in view of Pope's proclaimed victory. However, I finally reached Centreville and soon afterward began to distribute the instruments, blankets, medicines, stimulants, etc., I had brought. I had 400 dozen bottles of whiskey, brandy, sherry, etc.; 2600 blankets, 600 cases of soups in cans (one of the few things that were then put up in cans), 800 complete suits of underclothes, a dozen operating cases, etc. Before I left Washington I had been directed to be rather sparing in distributing these, and I obeyed orders; but afterward I had good reason to regret my want of liberality, for on the third day Colonel Fauntleroy, of the Sixth

Virginia Confederate Cavalry, marched in and took a hand in the game. He was accompanied by one of the surgeons of Lee's army, whose name, unfortunately, I do not remember; but I have a very vivid recollection—when I gave them the key of the little smoke-house in which I had stored the medicines, stimulants, operating cases, and smaller and more valuable things that I had brought along—how their eyes widened and their faces were wreathed in smiles as the doctor, after a rapid survey of the boxes on the walls, turned to the colonel and said, with an expletive: "There is more good whiskey in this little smoke-house than there is in the whole city of Richmond!"

The army left, and left me practically stranded. I was not attached, of course, to any regiment, brigade, or headquarters. Again, nobody gave me orders, but, as I found in the little church in Centreville one hundred wounded men who needed attention, I saw my duty well marked out. All of these men were severely wounded, for the slightly wounded marched away with the army. Upon a few mattresses, and with almost no other conveniences or comforts, the men were laid in rows on the floor. Most of them had, in fact, not even a mattress, but only a little straw under them, and this in a very little time, when "laudable pus" began to flow, became soiled and had to be diminished daily. The bed-sores which followed were something frightful, often larger than an entire hand; and when we add to all this the secondary hemorrhages, which often soaked the floor before they could be arrested, one can have an idea of the sufferings of these poor fellows, and of the task of those who were caring for them.

Moreover, the food problem soon became a serious one. We had only a very moderate supply of canned soups that the Confederates had very generously given us when their own commissariat was sadly deficient, and we had nobody to forage for us, for all of the able-bodied soldiers had gone away, lest they should be taken prisoners. Fortunately two or three of the Christian Commission and the Sanitary Commission were on hand and helped.

The third day after the battle I passed such a night as I had never before experienced in my life. Long trains of ambulances arrived, carrying our wounded from the field of battle back to Washington, and there were but four surgeons to look after them and their many imperious needs. Fifty poor, thirsty fellows were crying for water; fifty more were crying with the pain from a jolting ride of nine miles over a corduroy road. Most of them had had nothing to eat for one, two, or three days, save what they had obtained from the haversacks of poor fellows who were dead in their neighborhood. Some had such horrible wounds that they could absolutely go no farther, and must be got out on stretchers and taken into the hospital.

One of us immediately started with a pail of water and a tin dipper to supply the first want of all; another, as quickly as we could heat some soup, started on a similar errand to supply their hunger, while I took a bottle of morphine and my pocket penknife and did not worry over any superfluous exactitude in doling out the blessed relief which morphine brings to men in pain. All of this was done in total darkness, with two or three dim lanterns, in a drizzling rain, and in six inches of Virginia mud.

Fortunately, just as our food was giving out, an ambulance train was sent from Washington and took our patients and ourselves back to civilized conditions and surgical opportunities.

In September, 1862, I was sent to Frederick, Md., immediately after the battle of Antietam and assigned to Hospital No. 1, in charge of my since then life-long friend, Dr. Robert F. Weir. One little incident that occurred just after I got there was of a good deal of personal interest to me. After the battle, when the present Mr. Justice Holmes, of the Supreme Court of the United States, then a captain in the army, was wounded, his father, Dr. Oliver Wendell Holmes, immediately left Boston to find him. The journey is embalmed in a delightful account, published soon afterward in the *Atlantic Monthly* under the title "My Hunt after the Captain,"[1] though he did not include in his story the

[1] Atlantic Monthly, December, 1862, p. 738.

following little incident: In 1862 Holmes, of course, was really at the height of his fame. The *Atlantic Monthly* had only been started a few years before, when I was a student in Brown University. In its very first number the publication of the "Autocrat" began, and through this the entire country knew him well. One day at noon, having just finished the round of my ward, I was sitting in the office in undress uniform. The only other person present was the officer of the day, who, of course, was in full uniform. He was a gentleman whose knowledge of English literature was quite limited, and I fear the same criticism could be made upon his knowledge of surgery. The door opened and with a quick step a dapper little man, whom I instantly recognized by his portrait, though I had never seen him before, stepped in, glanced from one to the other, and quickly walked up to the officer of the day. He introduced himself by saying, "My name is Holmes, Dr. Oliver Wendell Holmes, of Boston. I have come in search of my son, who is wounded." My colleague looked at him for a moment, scratched his head to gather his fugitive ideas together, and repeated in a half-absent tone: "Holmes, Holmes, seems to me I have heard your name before, sir;" at which, in spite of paternal anxiety, the Autocrat's eyes twinkled with amusement.

The surgery of that time was very simple—cold-water dressings or simple cerate spread on lint made by patriotic women by scraping one side of old linen sheets or table-cloths, or, to encourage suppuration (for pus at that time could be "laudable"), the ordinary flaxseed poultice. An amputation stump was always dressed with a Maltese cross of lint spread with cerate. Hanging out of the two ends of the wound were from five to twenty or thirty silk ligatures, one two, or three of them with one or more knots tied in them in order to identify those ligatures which belonged to the larger vessels. From about the fourth or fifth day traction was made upon each string to see whether the tissues had rotted away sufficiently to allow it to become detached. The knotted ligatures on the large vessels were not touched for a week or ten days, and not uncommonly when they came away, either

spontaneously or from traction, a gush of blood would announce a secondary hemorrhage, requiring reopening of the wound, or in some cases of repeated hemorrhage a ligation of the vessel higher up in the limb or an amputation. Sometimes, as in Lord Nelson's case, these ligatures on large vessels did not come away for many years.

What we did not have in those days was almost more noticeable than what we did have. Among our blessings, however, were ether and chloroform. Ether, it will be remembered, was first used publicly in the Massachusetts General Hospital on October 16, 1846. Chloroform was discovered by Sir James Simpson in the following year, 1847; yet you will be surprised when I tell you that Lord Roberts records, in his *Forty-one Years in India*, that in the Sepoy Rebellion of 1857, ten and eleven years after the discovery of chloroform and ether, there were no anæsthetics to alleviate the sufferings of those heroes who were wounded during the terrible siege of Delhi.[1] We had, however, no antiseptics, for antisepsis was as yet even undreamed of; hence, erysipelas, pyæmia, and hospital gangrene were rife. Many a time have I had the following experience; indeed, it was fully expected and looked upon as unavoidable: A poor fellow whose leg or arm I had amputated a few days before would be getting on as well as we then expected—that is to say, he had pain, high fever, was thirsty and restless, but was gradually improving, for he had what we looked on as a favorable symptom—an abundant discharge of pus from his wound. Suddenly, overnight, I would find that his fever had become markedly greater; his tongue dry, his pain and restlessness increased; sleep had deserted his eyelids, his cheeks were flushed, and on removing the dressings I would find the secretions from the wound almost dried up, and what there were were watery, thin, and foul-smelling, and what union of the flaps had taken place had melted away. Pyæmia was the verdict, and death the usual

[1] "Anæsthetics and antiseptics were then unknown (!); consequently few of the severely wounded recovered and scarcely a single amputation case recovered." Lord Roberts, vol. i. p. 195.

result within a few days. The total number of cases of pyæmia reported during the war was 2818, of whom 2747 died, a mortality of 97.4 per cent.[1]

Erysipelas, too, was rampant, and it was a common observation that it followed the direction of the wind, both in the same ward and in its direction from one ward to another. We had already learned the hard lesson, however, that our erysipelas cases must be isolated and dressed last or an epidemic would occur; why, the best of us could not tell. Hospital gangrene—a disease now banished, I hope, forever—whose very name is a bit of sarcasm, was very common. In the hospitals of Louisville alone, and for only a portion of 1862 and 1863, Middleton Goldsmith tabulated 343 cases, with a mortality, happily, of only 21, or 6.2 per cent. The total number of cases of gangrene of all kinds was 2642. In 2503 cases in which the result is known 1361 recovered and 1142 died, a mortality of 45.6 per cent.[1] It was a phagedenic ulceration, which, if we should see it now, we would probably find was due to a streptococcus infection.[2] Often did I see a simple gunshot wound, scarcely larger than the bullet which made it, become larger and larger until a hand would scarcely cover it, and extend from the skin downward into the tissues until one could put half his fist into the sloughing wound. In my report upon Hospital Gangrene[3] as it occurred in Frederick, Md., and in the West Philadelphia Hospital, I pointed out that repeatedly a few days of cold, rainy weather, requiring windows and doors to be closed, thus preventing a change in the atmosphere of suppuration, which then was normal, would be followed by an outbreak of hospital gangrene, and a few days of warm sunshine would promptly check its ravages. One case in particular, after Antietam, I remember. A wound on the inside of the upper thigh which enlarged and deepened, first exposing the femoral artery, then eating its way deeper and

[1] Medical and Surgical History, etc., part iii., Surgical Volume, p. 824.

[2] For good illustrations of this practically vanished disease see the colored plates in the Medical and Surgical History of the War, part ii., Surgical Volume, pp. 739 and 928, and part iii., Surgical Volume, p. 53.

[3] Medical and Surgical History, etc., part iii., Surgical Volume, p. 826.

deeper under the artery until the pulsating vessel stretched like a red rope across the chasm. Beside his bed, day and night, sat an orderly with instructions, in case secondary hemorrhage occurred, instantly to screw down the pad of a Petit tourniquet placed *in situ*. It was one of the most instructive illustrations I have ever had of the resistance of the fibrous and muscular wall of an artery. After a time the gangrene was arrested, the artery became covered with granulations, the chasm below the artery slowly filled until the granulations reached up to the artery, then gradually rose on each side of it and finally covered it completely, and the wound cicatrized without the loss of a drop of blood.

Our method of treating hospital gangrene, which was empirical, we now know to have been based on sound pathological grounds. Isolation and fresh air, and locally pure nitric acid, the acid nitrate of mercury, the actual cautery, or bromine, as was introduced into practice by Middleton Goldsmith, were our only, but efficient, weapons.

Tetanus also claimed its frequent victims. Of 505 cases 451 were fatal, a mortality of 89.3 per cent.

While I was in Frederick, Dr. John H. Brinton began what is now the most splendid military museum in the world, that of the Surgeon-General of the Army in Washington. He appointed me his representative in and about Frederick and later in Philadelphia. It was my duty to gather and forward all the specimens that I could lay hands upon.

Among them I remember were more than a score of knee-joints, every one of which with our then surgical resources should have been amputated. Conservative treatment of joints was an impossibility until antisepsis and asepsis made it not only a possibility, but a duty. The popular opinion that the surgeons did a large amount of unnecessary amputating may have been justified in a few cases, but, taking the army as a whole, I have no hesitation in saying that far more lives were lost from refusal to amputate than by amputation.[1]

[1] "Conservative surgery was practised too much and the knife not used enough." Letterman's Medical Recollections of the Army of the Potomac, p. 49.

Wounds of the abdomen involving the viscera were almost uniformly fatal. If we were absolutely certain that the bowel was penetrated by finding fecal matter exuding through the wound, of course we would then open the abdomen, but he was a bold surgeon in those days who would do an abdominal section without such positive knowledge. Opium was practically our only remedy and death the usual result. Not more than one incontestable example of recovery from a gunshot wound of the stomach and not a single incontestable case of wound of the small intestines are recorded during the entire war among the almost 250,000 wounded. Of recovery after wounds of the large intestine there were 59 cases. When we remember that to-day recovery has followed as many as 19 perforations of the bowel and mesentery, it gives those of us who went through the Civil War many a pang of conscience. Only too sharply do we remember the dreadful things that we did do and the good things that we did not dare to do.

Of 852 amputations at the shoulder-joint 236 died, a mortality of 28.5 per cent. Of 66 cases of amputation of the hip-joint 55, or 83.3 per cent., died. Of 155 cases of trephining 60 recovered and 95 died, a mortality of over 61 per cent. Of 374 ligations of the femoral artery 93 recovered and 281 died, a mortality of over 75 per cent.

These figures afford a striking evidence of the dreadful mortality of military surgery in the days before antisepsis and first-aid packages. Happily such death-rates can never again be seen, at least in civilized warfare.

Among other specimens one of the most curious which I sent the Army Medical Museum is a bullet which I found at a post-mortem in a very unique position. It was caught in the omentum, so that when the omentum was held up the ball was suspended in a net.[1]

The mischief one ball may cause was well shown in a later student and friend. It entered just below the left eye and emerged just

[1] Medical and Surgical History, etc., part ii., Surgical Volume, p. 174.

behind the lobe of the left ear: (1) a long-standing caries of the bones followed; (2) the left ear was deaf; (3) the left eye was blind; (4) the left facial nerve was destroyed, causing paralysis of the left side of the face; (5) the ball passed through the left temporomaxillary articulation and ankylosis of the jaw followed; (6) a surgeon who attempted to remedy this ankylosis broke a number of his good teeth, and also by a later operation caused (7) a salivary fistula, requiring (8) another operation for its cure; (9) repair of his teeth was impossible on account of the ankylosis, and (10) he was compelled to live all his life after his wound on soft diet, being able only to separate his teeth to a very slight extent and not being able to masticate other food. In spite of all these accumulated troubles he was a most cheerful, useful, and devoted surgeon in the Marine Hospital Service, and a well-known expert on yellow fever—the late Surgeon Murray.

During the winter after Antietam I was ordered to the (West Philadelphia) Satterlee Hospital. One of the curious memories of a colleague in that hospital was when I quickly arrested his hand just as he was about to fashion the flaps the wrong way, so that the stump would have been whittled down like a lead-pencil, and the flaps have been left on the amputated portion.

Another vivid memory was my experience with secondary hemorrhage after the battle of Gettysburg. Cases of secondary hemorrhage began to appear even before the end of the first week, but during the second week they occurred with dreadful frequency. When I was on duty for twenty-four hours as officer of the day, and it was my duty to attend to all emergency night calls, I had five cases of secondary hemorrhage in a single night about two weeks after the battle. In the last twenty years I do not remember five other cases, thanks to antiseptic surgery. One of the former I particularly remember, a gunshot wound just above the inner end of the right clavicle. The bullet had not emerged; its direction was unknown; the hemorrhage was profuse; whether from one of the smaller transverse vessels of the neck or from the carotid, jugular, subclavian, or even the innominate, was wholly unknown. I etherized the man and pro-

ceeded to search for the wounded vessel. My only light was a square block of wood with five auger holes, in each one of which was placed a candle. It was before even the days of petroleum, which had then just been discovered in Pennsylvania. As the wound was so near the mouth, of course the light had to be near the ether cone. I have often wondered why I did not have the sense to use chloroform. Suddenly the ether took fire and the etherizer flung away both cone and bottle. Luckily the bottle did not break or we might have had an ugly fire in a hospital constructed wholly of wood. I was fortunate enough finally to secure the vessel after much searching and a large loss of blood, and was gratified to discover that it was one of the transverse arteries of the neck. The patient recovered.

This case illustrates well the disadvantages under which we then labored. There were no hemostatic forceps. In the depths of such a wound the tissues could not be seized and drawn up to the light and the bleeding vessel quickly clamped. Our only resource was to try to pass a tenaculum through the vessel and tie it with silk. Usually we were only successful after several attempts. Meanwhile that vessel and others were all bleeding; the others had to wait their turn. Moreover, we had no retractors by which we could get a good view of the depth of such a wound. We had no hypodermic syringes at the beginning of the war, and they were not in common use till some years after its conclusion. The mouth and the bowel were the only avenues for the administration of remedies. We had no aspirators and, what will astonish many of my younger hearers, we had no clinical thermometers; our only means of estimating fever was by touch. It was not until several years after the war—say, the early seventies—that the thermometer became a common instrument. It was then about from ten to twelve inches long, was never used excepting in the axilla, from which it stuck up like a mast, and was often broken by movements of the patient or pressure of the bed-clothes. The first short clinical thermometer, such as we now have, which I ever saw was a gift from my friend, Dr. S. Weir Mitchell, brought from London in 1876. Many of my other thermometers

have met with casualties and finished their career by sudden catastrophies, but this one, strange to say, has had a charmed life, doubtless due to the distinguished giver, and I still use it with great satisfaction.

In 1863, at the request of Drs. Mitchell and Morehouse, I was ordered to the Christian Street Hospital, in the old police station which still stands on Christian Street below Tenth Street, and later in the Turner's Lane Hospital, which then stood in the midst of a large farm near Twenty-second Street and Columbia Avenue. These two hospitals were successively devoted to the diseases and injuries of the nervous system.

The first nervous case that I remember was a very remarkable one, and the first of its kind ever recorded. It occurred while I was executive officer at the Satterlee Hospital, West Philadelphia, a very short time before I was ordered to the Christian Street Hospital. As executive officer it was my duty to assign new patients to the wards, and also to transfer the cases in the specialties, such as the eye, nervous diseases, and injuries, etc., to the special hospitals. One morning, as I sat at my desk, a soldier applied for assignment. On looking up at him I said to myself: "You are Dalton's cat." Those of you who are familiar with Dalton's good old text-book of physiology will remember a cat whose right cervical sympathetic nerve had been severed. The left pupil is very large, the right one very small, and the moment I looked at this man I was struck with the similar condition of his pupils. I quickly asked him, "Where were you wounded?" and when he pointed to his neck I said to myself again, "That ball destroyed the sympathetic nerve." I immediately transferred him to the Christian Street Hospital and a few days later followed him. His case is reported in full in our little book on *Gunshot Wounds and Other Injuries of Nerves*, p. 39. In the autumn of 1864 I took a copy of this book to Claude Bernard, in Paris, the discoverer of the function of the cervical sympathetic and the effect of its division upon the pupil and the bloodvessels. He exhibited true Gallic enthusiasm when I showed him the first recorded case in the human subject, which

confirmed his brilliant researches, which were the beginning of our knowledge of nature's beautiful automatic regulation of the blood supply.[1]

The results of injuries of nerves have been dwelt upon fully by Dr. Mitchell, and I need say little about them. All of our patients, of course, were convalescents. The phenomena of fatal cases we had no opportunity of observing, but I can never forget the extraordinary contractures, paralyses, and other results of the extensive wounds of nerves such as we studied there for the first time. One poor fellow (since then I have seen one similar case) was shot directly through the posterior portion of both eyeballs; another had necrosis of a large part of the body of the third cervical vertebra. The sequestrum discharged through the mouth, showing the anterior portion of the foramen for the transmission of the vertebral artery, which, fortunately, did not suffer either by the original wound or the secondary necrosis and suppuration.

Very naturally among so many soldiers of diverse character, and especially of men with wounds and injuries of the nervous system, we had perhaps more than our usual proportion of malingerers. In the *American Journal of the Medical Sciences* for October, 1864, p. 367, in a paper on "Malingering," especially in regard to simulation of diseases of the nervous system, a number of our conclusions were stated. From the necessity of the case we devised some new means for discovering such malingerers. We first suggested the use of ether (alone or in combination with other means) as a test in a number of alleged diseases and conditions in which it had never before been used. It proved a most efficient method of detection. For instance, in asserted blindness we suggested that the man should be etherized, the *sound* eye then covered with adhesive plaster, and, when recovering from the anæsthetic, before he was able to reason and guard himself against making mistakes, that his sight should be tested by very

[1] This was the real starting point of our knowledge of the functions of the sympathetic nerve, although Pourfour du Petit, in 1727, had noticed the effect of its division on the pupil. (De Schweinitz.)

simple means, such as holding out to him in the hand some water or some whiskey, or any other act which would reveal the presence or absence of sight in the supposed blind eye. So in deafness we discovered some malingerers by the old trick of gradually lowering the voice. But hearing, like sight, can best be tested during the recovery stage of ether when the patient is taken unawares, as Parr, in his *Medical Dictionary*, speaks of a man who pretended to be dumb, of whom a sympathetic passer-by, with most insidious humanity, inquired: "How long have you been dumb, my good friend?" "Three weeks, sir," replied the uncautious deceiver.

We also recorded what Da Costa first called our attention to: that in feigned lameness the cane is apt to be put down *after* the leg instead of before, whereas a really lame man, needing the support of a cane, always will put the cane down *first*. In some instances the substitution of the urine of a soldier known to have renal disease by a malingerer for his own, of course, was readily detected by having him pass his water in the presence of the ward-master or of the surgeon.

In both paralysis and ankylosis we again resorted to the use of anæsthesia, a means which now, of course, everyone is familiar with, but which at that time was a novelty. Sometimes it was not needed, as accident would disclose the fraud. Thus, one of the most persistent and successful malingerers at last unmasked himself. His right arm had long hung useless by his side. One day, as he was going out on leave, a high wind suddenly blew the cape of his overcoat over his head, and in an unguarded moment both arms were raised to throw back the cape so that he could see. The Army of the Potomac speedily received a reinforcement of one. A necessary precaution is to be noted, namely, that sometimes malingerers who had been in the ward a considerable time, and had seen other patients etherized, not only feigned disease but feigned complete anæsthesia long before it actually existed, and thus very nearly deceived us. A little extra dose, so that one is absolutely *sure* that the etherization is real and not imitated, of course, will avoid this danger. In this manner we

detected one man whose arm had been "paralyzed" for a long while, and left him yawning and stretching himself with both arms far above his head, and every effort to move them down resisted by his deltoid, which previous to this test had been entirely useless. The same test served us well in some cases of alleged aphonia. The old adage "*In vino veritas*" might well be applied to anæsthesia. The supposed blind will see, the dumb will speak, the lame will freely move paralyzed limbs, deaf ears will be unstopped, and all in spite of the malingerers' best efforts.

In one of our cases of aphonia, detected without the slightest difficulty, the patient, however, quickly recovered himself and fell at the surgeon's feet with clasped hands, exclaiming with a voice and attitude worthy of a Garrick: "Thank God, Doctor, you have restored my voice!"

Our means of detecting fraudulent epileptics are fully described in the paper above mentioned. For want of time I cannot do more than refer those interested in the subject to it for details.

Three things are impressed upon my mind as a result of this review of the surgery of the Civil War. The first is the utter inadequacy of our present system of enlargement of the medical corps of the army when war or a great battle suddenly precipitates this necessity upon us. The parsimony of Congress has cut down the number of the medical military establishments below what is necessary for a proper performance of its duties even on a peace basis. The Surgeon-General always is forced to employ a large number of acting assistant surgeons, who, faithful as they may be, can ill supply the place of men trained in the regular medical corps. When war suddenly comes, an enormous number of barely competent or often incompetent men must be put in charge of the lives and health of the soldiers, men who are as utterly untrained as I have shown I was when I entered the army. The medical corps of the army should be enlarged, as was urged upon the last Congress by the President, the Secretary of War, and the Surgeon-General. All vacancies should be filled and measures taken, either under existing or future laws, to have a supplementary medical corps ready for instant service.

A second reflection is that, subject of course to imperative military requirements, the medical officers should have substantial control over sanitary matters, such as camping places, latrines, water supply, etc. These are often vital to the efficiency of an army. Our later experience in the Spanish-American War, and by contrast the extraordinary results which have been obtained by the Japanese methods, reinforce this suggestion in a most striking way.

The last reflection is that those who made such a fearful outcry as to the sufferings of our soldiers in the Spanish-American War, though justified to some extent, did not know what suffering was as experienced during the Civil War.

When a battle occurs the survivors of the regiment must march away with the army and some of their surgeons must go with them. When therefore tens of thousands of men are wounded in a day or two, the number of surgeons available is totally inadequate for the sudden emergency. It is absolutely unavoidable, no matter what progress is made in the scientific treatment of wounds by first-aid packages and other devices, or in methods of transportation, that men, especially those of the defeated army, must often lie on the battlefield one, two, three, or more days before they can possibly be attended to. The horrible suffering this entails is part of the grim penalty of war. Those of us who went through the Civil War are the most anxious to avoid another war. Only a righteous and noble cause can justify such sacrifices and suffering.

MEDICAL REMINISCENCES OF THE CIVIL WAR[1]

Remarks by JOHN S. BILLINGS, M.D.

In the Fall of 1861 I went to Washington to appear before the Medical Examining Board of the Regular Army. I had graduated from a medical college after a two years' course, each year having exactly the same lectures. I had had two years' hospital experience, and I had been demonstrator of anatomy for two years, so that while I had my doubts about my passing the ordeal of the Army Medical Board, from what I had heard of its severity, still I thought that probably I should get through. I came up before the Board, and at about noon of the second day I began to feel rather comfortable and thought I was getting on very well; but by noon of the third day there was a consultation between the examiners, and they began all over again, going back to anatomy and to the beginning of things. That went on for three days more and made me very uneasy. I did not learn the explanation of this until long afterward. When it was all over Dr. McLaren, the President of the Board, said to me that he hoped I would take service at once with him—that he could not get my commission for some time, but that I could be made a contract surgeon without delay. I agreed to this, was introduced to Surgeon-General Finley, got my contract and was told that I was especially detailed to go to the Union Hotel Hospital in Georgetown, which was under the direction of Surgeon McLaren.

I began service, and had three things with me that none of the other surgeons had: A set of clinical thermometers like those Dr. Keen talked about, a straight one and one with a curve; a hypo-

[1] Read April 5, 1905.

dermic syringe, and a Symes staff for urethral stricturotomy. The hypodermic syringe was in constant requisition. The clinical thermometer was troublesome and was not used very much. The medical director of the army was Dr. Charles S. Tripler, who had seen me operate for stricture of the urethra the year before, and thought the results were very good. Consequently whenever any surgeon of troops about Washington applied for the discharge of one of his men for the reason that he had an impermeable stricture of the urethra, instead of granting the discharge, Dr. Tripler sent that case to me. There were quite a number of them, but I have no statistics of my cases.

One day in the Spring of 1862 I was in the hospital office when two men walked in—one a large man with an air of importance, the other a small man who had said very little. The large man said they would like to see some of the cases in the hospital. They did not give their names, but I thought it was proper to show the cases, and so took them around. Practically I had done most of the operations in the hospital. After spending about two hours they went down to the desk and the big man said to me, "Dr. Billings, I wanted to see the man who beat my student Adams." I told him I didn't know who "Adams" was. He said, "Don't you know the results of your examination?" I said, "No." He then said, "When you came up for examination they had finished their class, and the report was just ready to go in, when you were sent over with an order to be examined. They looked up your paper, found that you were born in Indiana, and thought they would make short business of it. At the end of the first day they concluded that probably you would pass, but hoped it would not be necessary to change the order of precedence in the roll, and that you could come in at the bottom. The second day they thought they would have to put your name higher up, and on the third day they concluded that you would be at the head of the class, but that, to be fair, they ought to ask you the same questions that they had asked Dr. Adams, who was previously the head of the class, and so they began all over again with you. I then learned that my callers were Dr. Ham-

mond, Surgeon-General, and Dr. Letterman, Medical Director of the Army of the Potomac. Dr. Hammond said to me: "Day after to-morrow all the surgeons in this hospital will be relieved, which will leave you in charge. You will be sent some contract doctors, and you are to go to the cavalry barracks at Cliffburne, on the hill back of Georgetown, turn them into a hospital, and move this hospital out there as soon as possible."

The surgeons were relieved. I did establish the Cliffburne Hospital, and when the wounded came in from the seven days' fighting before Richmond I was ready for them, and had very excellent opportunities for operative work.

I secured sixty Sisters of Charity, who took charge of the nursing side of the work. We should not think them particularly skilled at the present day, but they were very good for that period.

One of the difficulties at Cliffburne was that we had a large number of Confederate as well as of Union wounded. The old residents of Georgetown and Washington were mostly in sympathy with the Confederates, and came out bringing good things to eat and drink, with the desire that these things should be for the exclusive use of the Confederates. On the other hand, the ladies of the families of members of Congress and of officers in the departments were enthusiastic for the Northern side, and they also came with various good things, but with the specification that none should go to the rebels. We would not receive gifts from either party on these terms, but after a little explanation they were left to be used for those who needed them most.

I remember a member of Congress from New York City who came up and said: "You have got a lot of my boys here; I would like to do something for them, something that the papers will notice, you know. What do you think I had better give them?" I said: "They have all got more or less scurvy, and I think fresh strawberries would do them good. You might have a strawberry festival, and have a band here."

He agreed, and it was a great success, as the reporters duly proclaimed.

At the battle of Chancellorsville there was a good deal of joking among some of our line officers about the doctors not getting up to the front, that they kept in a comfortable place about a mile back, etc. This was mostly chaff, but there was a little bit of earnest in it; so I said I would go up and see. The regiment came under fire, and was then less than 200 yards from the Confederates, and I was, perhaps, 40 yards behind the firing line. I stopped behind a little frame house, giving notice to bring the wounded there. I soon found that the wounded who could walk would not stop where I was—it was entirely too close. At first the men that were more severely hit were brought back by members of the band, but very soon there were no more bandmen, and they never came back for a second load. When the men began to bring their wounded fellow soldiers in they would not stop where I was. Finally a shell went through this wooden shanty, making a deuce of a clatter, and that settled the question of the men stopping. The slightly wounded men would not stop, and the bearers of the badly wounded men would not stop, so I moved back about 200 yards and began to work there, but soon got an order from the medical director saying that I was still too close, and must go back to the Chancellor House about a mile away and establish my hospital there. The next morning the Chancellor House came under artillery fire and I had to move again. Fortunately I was able to get all the wounded out of the house and to move them back another mile or so into a little hollow without losing any of them. But one of my assistants was killed.

My experience in Chancellorsville was that of handling wounded without an ambulance corps, and getting them off when the troops were falling back. It is one thing to provide for wounded when the troops are advancing and leaving the hospital behind, and quite another thing to fall back with your wounded when the troops are retreating.

Let us take another field hospital scene—this was at the battle of Gettysburg. There I established the hospital at a farm house on the side of Round Top, perhaps half a mile behind the first

firing line. In the house we found dough kneaded and nearly ready for the baking pans, which had even been greased. There was a fine fire in the stove, but nobody about the house. I got my men to separate that dough into reasonably sized lumps and slip them into the oven. Then we found a big copper boiler which we filled with water and made coffee and some soup. In about twenty minutes the wounded began to come in, and we had about 850 before 12 o'clock that night. They all got hot coffee and hot soup, but there was not enough bread to go beyond the first hundred. The seriously wounded were in the house, and near it under the trees and in the big barn. The slightly wounded picked their own places on the outskirts. About midnight Dr. Letterman came in and said that he had just learned that this particular place was going to be shelled early in the morning, and that we should have to move on at once. I found a place a mile to the rear, where there was plenty of water and shade, and we began to move early in the morning. Here I had an ambulance train and the work of moving was safely accomplished. A few shells began to drop near as the first train of ambulances moved off, but no one was injured.

As usually happens, about the second day it began to rain and rained continuously for five days, and the supplies were slow in coming. Various State auxiliary associations brought fresh bread, mutton, fruits, etc., for their State regiments, but there were none for the regular troops. Finally there came along a wagon from the Fire Department of Baltimore. They said: "This is just the kind of place we want to find, that don't belong to any State." Baltimore was rather neutral. After the wagon had been unloaded they informed me that they had packed one box for the surgeon. I got the benefit of that box, and it was most judiciously packed.

Let us take another scene:

A little later, at the battle of Spottsylvania, in 1864, the Army of the Potomac had an ambulance corps well disciplined. In that campaign I was a medical inspector of the army, and had

a chance to look around and see what other people were doing. The first battle of the Wilderness lasted about three days. The wounded were taken back to Fredericksburg, the line of the Rapidan was then abandoned and another battle began. A large number of wounded soon resulted, but there were no ambulances, nor had we the conveniences which the ambulances supplied. Huts and shelters were built of cedar and pine branches, and we did the best we could until the ambulances returned the next day. The day was hot and sultry, the air was filled with clouds of dust, and the woods were on fire in various places. It was hard to find water, and when found it was warm and muddy. The medicine wagons could not be brought up, for the roads were blocked. The surgeons worked in their shirt sleeves, using such materials as were in the field cases, and they worked well—far into the night. I shall not give you any more illustrative scenes. My general observations agree with those of Dr. Keen, that there was not enough of operating in the state of knowledge we then had. A very few men performed operations which were unnecessary, amputating a few limbs which might have been saved, but the great majority were timid and anxious to shift the responsibility and to get the simplest dressings on as soon as possible.

During the first year of the war there was no good organization for collecting the wounded. In the second year they had acquired the idea that the doctor might be considered a general staff officer, and there was an ambulance corps. In the third year there was an order issued that the chief surgeon of the corps and the division surgeon should be at the Division Hospital, because there they could be more easily found. The brigade surgeons were often made the operating surgeons. The result of this was that all the chief officers were gathered together at the Division Hospital; and there was plenty of work for them, but the other surgeons and assistant surgeons were without directions, and were left to exercise their own will and pleasure, if they had any. In the case of Dr. Keen, when he didn't get orders, he acted on his good judgment, but a good many did not have that quality, and hence did little or nothing.

Looking back at the war as I remember it, it is a wonder that so many of the medical officers did as well as they did, and that the results were as good as they were. My main criticism of the surgical work which I saw was that too much resection was attempted in cases of injury of the long bones. If a ball smashed a femur some surgeons wanted to get out all of the fragments, although in doing so they made the injury much more severe.

During the first two years of the war the records of the wounded in field hospitals were often very imperfect, for comparatively few surgeons made notes of their cases. During the last two years of the war the records were much more complete, as a medical officer and a hospital steward were often detailed for the duty of making such records.

FOUR CASES OF CEREBROSPINAL MENINGITIS PROBABLY DUE TO THE PNEUMOCOCCUS.[1]

By ROBERT N. WILLSON, M.D.

The following cases are reported for two reasons, both independent of their inherent clinical interest.

First, because they demonstrate in a manner which appears to me to be beyond cavil that the popular teaching, to the effect that pneumococcus meningitis is *a priori* a fatal condition, is not altogether warranted by clinical evidence; and second, because from the similarity of their clinical pictures they offer an opportunity of discriminating between this and other forms of cerebrospinal inflammation.

Case I.—R. M., female, white, aged twenty-three years; engaged in housework. Father died of diabetes; mother alive and well. Patient had the ordinary diseases of childhood and also diphtheria, from which she completely recovered. Had pneumonia last February, and during her convalescence went out in rain. Began to feel chilly two days later (three weeks prior to admission to the Philadelphia Hospital), and experienced irregular chills and fever during the next two weeks. Patient did not go to bed. A week passed by before headache appeared. Three days later stiffness of the neck was noted, and active vomiting, following the taking of medicine. On April 4, 1905, she was admitted to the ward, subsequent to an attempt, on the same day, at lumbar puncture by her family physician, who failed to reach the canal. On admission she was mentally excited, her neck rigid, her pupils equal and dilated, but reacting normally to light and distance. Her head seemed "as if it would split open," to use her own expression. The tongue was typhoid in type, the pulse rapid, but of fairly good quality, the skin of the arms and legs was hyperæmic and hyperæsthetic. There was a rose-colored eruption upon the chest and upper arms, disappearing on pressure or stroking. The patellar reflexes were nearly absent. Babinski's phenomenon was present, and Ker-

[1] Read June 7, 1905.

nig's knee contracture was present in marked degree. The tache cerebrale was prompt and persistent. The patient complained of photophobia and called attention to a diplopia in the left eye.

On April 21st (two days later) the right pupil was larger than the left, and ptosis of the left eyelid was present.

On April 23d there was also slight external strabismus of the left eye. The pupils were again equal and widely dilated. Nystagmus was noted.

On April 24th Dr. Hansell reported nystagmus on all forced movements. Occasional divergence of left eye, with limited movement upward. Partial ptosis of left eyelid. Media clear; fundus in both eyes normal.

On May 1st I noted a decided lateral curvature of the spinal column to the right. Also the physical signs indicating a healed or quiescent tuberculous involvement of the right apex; also a friction rub and a few fine rales to the left of the sternum in the third interspace. The heart was rapid in action, but all its sounds clear. The second pulmonic sound was accentuated. The abdomen was tender to palpation in the right iliac fossa. The urine contained a trace of albumin, but was otherwise negative.

Treatment. Great relief from the subjective symptoms followed the complete withdrawal of the cerebrospinal fluid on the day of admission, and without further treatment, except a low diet and rest in bed, the patient went on into an uninterrupted convalescence. When discharged, about two weeks ago, the eye symptoms had disappeared, there was no rigidity of the neck; Babinski's phenomenon had disappeared, but Kernig's sign was still positive.

Dr. Rosenberger made the following report upon the clear cerebrospinal fluid: "Upon centrifugalization for several hours no sediment was obtained. Inoculations were made upon agar, but no bacterial growth developed. The original tube was placed in the incubator, and in seventy-two hours a slight sediment was present, which was made up of micrococci resembling pneumococci, occurring in pairs, and retaining the dye by Gram's method. No cellular elements were observed."

Case II.—J. K. C., male, aged twenty-two years, occurred in private work. The father and mother were alive and well, one aunt insane, but there was no other suggestion of nervous involvement in the family.

I saw him in my office on March 14, 1905. He had a severe headache, which gradually increased in intensity until he next presented himself for inspection two weeks later. He had failed to see Dr. Posey, to whom I had sent him, but on consulting him subsequently Dr. Posey sent the following report: "Optic neuritis in both eyes, most marked on the right side. Left-sided ptosis. None of the other extraocular muscles seem to be affected. The irides respond well to light and accommodation stimuli. Vision is normal in both eyes, and there is no restriction in the visual fields. The patient seems to me to be wildly delirious."

The patient was seen the same evening in St. Agnes' Hospital. There was intense headache, some resistance and pain on pressure over the nuchæ and occiput, the pupils were dilated and equal, and there was ptosis of the left eyelid; also decided palsy of the left side of the face, the tongue, and the lips. The pulse was fairly slow and of high tension. There was no eruption, no herpes. The spleen was not demonstrably enlarged. The abdomen was altogether negative. The heart and lungs were normal, except for a marked accentuation of the second pulmonic sound. No pulmonary lesion could at any time be found.

The patellar and Achilles tendon reflexes were absent; Babinski's phenomenon was suggestive only; Kernig's sign was markedly evident on both sides. There was no hyperæsthesia and no anæsthesia.

On the following morning, after a seeming amelioration of the headache, the symptoms recurred with the same violence, and the cerebrospinal fluid was withdrawn, about 35 c.c. spurting from the cannula in a clear forceful stream. The headache at once became excruciating, and then, within a moment or two, disappeared altogether, and the patient had his first sleep during many days.

The fluid was slightly clouded (not turbid), and smear preparations showed considerable numbers of small encapsulated diplococci, resembling the pneumococcus, and retaining the stain by Gram's method.

The leukocytes were few in number and were mainly lymphocytes, and in no instance could I detect an intracellular coccus. Dr. O'Malley, examining independently of me, found the same organisms, and thought he discovered one within a polymorphonuclear leukocyte.

Cultures on agar and blood serum were all negative.

The Widal test was repeatedly negative, the leukocyte count (blood) was 5000, and the urine showed no abnormality.

Two hours after the spinal drainage the ptosis had disappeared, the headache had not returned, and the patient was altogether comfortable. The pupils were constantly dilated and equal. The photophobia was absent on the following day.

On April 10th lumbar puncture was performed a second time, owing to the recurrence of severe headache and photophobia. About 20 c.c. of clear fluid under high pressure were obtained. Relief was immediate, as in the former instance, there being on this occasion no preliminary exaggeration of the pain. Prior to this puncture the leukocytes in the peripheral blood numbered 10,800, the differential count showing almost normal relations of the various cell types.

On April 11th the normal plantar reflexes reappeared, other reflexes remaining absent. The pupils were still dilated. Four rose spots remained.

On April 12th there was the first suggestion of a patellar reflex. On April

13th the spots had disappeared. The patient now began to complain of hunger, and from this time on convalescence was steady.

He was last seen by me on May 10th, just prior to his departure from the city. The patellar reflexes were sluggish, though present on both sides. Kernig's sign was still markedly in evidence, and on examination by Dr. Posey there was still found to be a persistent congestion of the optic nerve heads.

On May 30th the patient wrote that on his return home he had "grippe, that his eyes again began to hurt, and that he had a jarring feeling in the spinal column on walking." He is now quite well, though Kernig's contracture is still present. The patient had often, to his own knowledge, raised his legs to a right angle without inconvenience prior to this illness.

Case III.—John H. D., white boy, aged fifteen years. Family history negative. Admitted to the Philadelphia Hospital May 18, 1905, just prior to the crisis of a pneumonia of the left lower lobe. The symptoms (pneumonia or meningitis) appeared with suddenness (chills, fever, vomiting) three days before his arrival at the hospital. On the following day the crisis occurred. Delirium, intense headache, nausea, and vomiting had all been present during the first day of the disease. There was no rash, and rigidity of the neck was absent. The nuchæ were tender to pressure, however, and not only was Kernig's sign present on both sides, but the patellar reflexes were altogether absent. The urine contained considerable albumin, also hyaline and granular casts.

Lumbar puncture was done on May 20th and clear fluid obtained. In the fresh fluid there were found (Dr. Rosenberger's report) "cocci in pairs, possessing the morphology and tinctorial properties of the pneumococcus." The cultures were all negative. No cellular elements, except erythrocytes, were discovered.

Whether due to or simply following the lumbar puncture, the temperature fell to normal and the convalescence was uninterrupted. Unfortunately this patient was discharged before the final observations were made upon the reflexes and upon the ocular condition.

Case IV.—John H., white boy, aged seventeen years. Admitted to the Philadelphia Hospital on March 11, 1905. Father and mother alive and well; five sisters alive and well. Two sisters dead—one of brain congestion, and another stillborn. Patient had measles and scarlatina as a child, but recovered perfectly. Smokes cigarettes to excess. Was at work until three days prior to admission, but mother says he was unusually cross and irritable for two weeks before. Three days before he was seen by me he became delirious, "had a high fever," was confused, and talked of fires continually. Complained of severe headache and of pain in his left side on coughing. On the day before admission he said his legs burnt, and then became actively delirious, rushing about the house.

He was admitted in an excited state, but soon relapsed into a stupor, from which he could not be aroused.

On March 13th there was complete incontinence of urine and feces. The urine contained no albumin, and only a few scattered hyalogranular casts. On March 15th there was also a trace of albumin. The Widal test was negative, as in all of the preceding cases. There was a slight impairment of resonance at the left base, with fine rales and harsh breath sounds. The second pulmonic sound was accentuated. The pupillary reflexes were normal, the pupils themselves dilated and equal. The tendon reflexes were all absent; Kernig's contracture was present on both sides; Babinski's phenomenon was not evident; sensation was preserved.

Lumbar puncture was done on March 16th and clear fluid obtained. Dr. Rosenberger reported that "it was negative in regard to bacteria and cellular elements. Inoculations of guinea-pigs were also negative."

The eye-grounds were normal, there being merely a slight hyperæmia of the disks, which were normal in size.

On March 15th it was noted that the mental condition was clearing, the patient being stupid, but neither delirious nor comatose. Kernig's sign was still marked, as was also the tache cerebrale, but there was no hyperæsthesia. The pulmonary congestion seemed to have disappeared; in fact, there was never a unanimous opinion among those who studied the case as to whether a pneumonia had actually been present.

On March 18th the leukocytes numbered 17,600. The pupil of the left eye measured 5 mm., that of the right eye 4 mm. The irides were sluggish in their response to light, but prompt to accommodation and convergence. The retinal veins were slightly engorged and tortuous. There was now full control over the bladder and rectum.

On April 2d there was evidently a gradual return to a clear mental condition. The patient was soon out of bed, hungry, and memory appeared unimpaired. On April 10th he returned to his home slightly dull mentally, but otherwise well. Kernig's contracture persisted up to the time he was lost sight of.

There are many interesting points connected with these cases, all of which have a positive bearing upon our understanding of the condition. First and foremost is the close association of 3 cases of meningitis, 2 without and 1 with pneumonic involvement, from all of which a diplococcus resembling the pneumococcus was obtained on examination of the cerebrospinal fluid; and one additional case of meningitis, persisting for some time after doubtful pneumonic signs had disappeared, in the fluid from which no bacteria could be found either by direct or by culture methods.

The latter case, in fact, suggests the series of instances reported by Wertheimer,[1] in which he found a non-bacterial serous meningitis following a number of cases of pneumonia. In one of these cases he performed lumbar puncture fourteen times within a month with final recovery.

Another item of interest centres in the fact that although diplococci resembling pneumococci were evident in smear preparations from the fibrin film which forms after a few hours in all cerebrospinal fluids (Cases I. and II.), and in Cases II. and III. from the fluid itself before the film had formed, nevertheless from only one of these specimens could the organism be grown, and then only in the fluid itself, appearing seventy-two hours after being placed in the incubator. This difficulty of cultivation would render the suspicion at least tenable that we were dealing with the meningococcus, were not the morphology and the staining qualities in Cases I. and II., and in Case III. also the preceding pneumonia so strongly in evidence for the pneumococcus.

In each and every case the prevalence of the meningococcus infection rather biased the mind toward this more frequent form of epidemic meningitis. A case in which the typical intracellular organism was studied was under observation at almost the same time in another ward of the same hospital and in the same service.

Again the finding of one intracellular diplococcus in the fluid from Case II. might seem to indicate a possible confusion with the meningococcus were it not for the positive retention of the stain by Gram's method in every instance. Moreover L. B. Wilson[2] reported in 1901 two cases of cerebrospinal meningitis in which intracellular pneumococci were found not only in the cerebrospinal fluid within the leukocytes before death, but also in the brain exudate on postmortem. The leukocytes contained from one to twelve cells each.

In Case II. several stains were employed by me to eliminate the possibility of introducing an extraneous organism with the

[1] Münch. med. Woch., vol. li., No. 23.

[2] Journal of the American Medical Association, December 21, 1901, p. 1675.

staining fluid. Thus it would seem fair to conclude either that the pneumococcus was actually present, and the cause of the meningitis, or that in each and every case the diplococcus of Weichselbaum must have taken on a new morphology and staining qualities. The former of the two is of course the more natural and rational inference, in spite of the almost inexplicable refusal of the organism to grow upon the various culture media.

The Diagnosis. It is of vital importance in discussing cases such as the foregoing that the diagnosis of cerebrospinal inflammation be established beyond all reasonable doubt, otherwise the mere finding of bacteria in the cerebrospinal fluid may have no more significance than the finding of pneumococci in the blood of the majority of patients in a ward in which a case of pneumonia has been treated. Especially is this true if we are to place reliance upon the accuracy of Cathelin's studies,[1] which seem to demonstrate a constant intercommunication between the blood stream and the cerebrospinal fluid by means of lymph vessels. Each of the cases considered in this paper, however, appears to give abundant evidence of inflammatory involvement of both the spinal and cerebral meninges. Case I. showed mild delirium, rigidity of the muscles of the neck, pain on pressure over the cervical vertebræ, intense headache, congestion of the optic disk, photophobia, inequality of the pupils, ptosis of the left eyelid, slight external strabismus, nystagmus; also loss of the tendon reflexes, and the appearance of the Babinski and Kernig's phenomena. The temperature chart also resembles the type usually seen in cerebrospinal infections of a mild grade. Still more important, however, was the association of the foregoing picture with a great excess of cerebrospinal fluid, and the prompt relief of the symptoms by the evacuation of the latter.

Case II. presented all the symptoms seen in Case I., and in addition a double optic neuritis of a much more advanced degree, palsy of the muscles controlled by bulbar centres, and the largest quantity of cerebrospinal fluid obtained from any of the case studied in this connection.

[1] Presse médicale, 1903, tome ii. No. 90.

Case III. appears to me the only doubtful one of the four, and yet even here the autopsy would be necessary to prove that the symptom-complex was not that of meningitis, the probability being for rather than against.

Case IV. admits of no doubt of extensive meningeal involvement, the offending organism being the only question in dispute.

Councilman's recent paper establishes beyond question what was taken for granted before, that all cases of actual meningitis are cerebrospinal, and were this not the case the symptoms would demonstrate it to be true at least with regard to the cases under discussion.

The Onset. In 3 of the 4 cases the onset was sudden, characterized by a chill, vomiting, and mental excitement. In one (Case II.) the prodromes extended over the greater portion of a month, consisting mainly of occipital headache, and eventually the symptom-complex of optic neuritis. At the end of the month delirium set in without warning, disappearing only with the relief of intracranial pressure by lumbar puncture.

Headache. Cephalalgia was present and intense in every case from the start until delirium or coma set in. In Cases I. and II. the relief following cerebrospinal drainage left no doubt as to the etiology of the headache. In Case II. the headache and ocular distress returned one week after the first lumbar puncture, and were dissipated at once by a second emptying of the canal.

Mentality. Delirium was present early in the disease in all of the cases except II., in which it appeared after a long prodromal period, and in all it disappeared after drainage of the cerebrospinal canal. Only in Case IV. was coma present, following the initial delirium, and persisting for eight or ten days. It finally yielded, and when the patient was lost sight of he was practically clear in mind.

The Reflexes. In all of the cases the patellar and plantar reflexes were absent on both sides very early and throughout the course of the disease. In all they gradually returned until they appeared normal.

Kernig's contracture was present in the hamstring muscles (not in the arms) in all, but in Case I. the patient stated that "she never could straighten out her knees." Case III., on the other hand, remembers distinctly that he could. Cases III. and IV. had no clear knowledge on the subject. In none of the four had Kernig's sign disappeared up to the time they were lost sight of by me.

Babinski's dorsal reflex was present at some time in all; in none, however, did it persist until the patient was out of bed.

The ocular reflexes appeared normal without exception. The tendon reflexes of the upper extremity appeared intermittently and irregularly normal and then abnormal.

The Ocular Findings. As already stated, the ocular reflexes were almost normal in every case and at all times. In Case I. on admission the pupils were equal and dilated. Later they were unequal, ptosis of the left lid appearing simultaneously with contraction of the left pupil, the right remaining dilated.

In Case II. the pupils were at all times dilated and equal.

In Case III. I find no note as to the size of the pupils.

In Case IV. they were at first equally dilated, and subsequently the left pupil became the larger of the two.

In Cases I. and II. there was marked ptosis of the left lid, disappearing almost at once; in Case II., following the drainage of the cerebrospinal canal. In Case I. it was much less marked following lumbar puncture, but disappeared finally only after several weeks' time.

Severe inflammation was evident in both optic disks in Case II. In Cases I. and IV. the disk was decidedly hyperæmic. In Case III. the eye-grounds were not examined.

Rigidity and Contracture. In all of the cases rigidity of the muscles of the neck and pain on pressure over the lower cervical vertebræ were constant and early symptoms. In Cases I. and II. the rigidity was much less marked following the lumbar drainage.

Case IV. showed a decided tendency to contracture of the hamstring tendons for some time during his early convalescence.

The Temperature, Pulse, and Respiratory Rate. The temperature in Cases I. and II. showed a marked tendency to an evening rise and a morning fall, the acme averaging 100°, but in Case I. frequently approaching 102°, and once exceeding 103.°

In Cases III. and IV. the resolving of the pneumonia, whether primary or intercurrent, apparently marked the final fall of the febrile curve.

In Case II., particularly, the temperature fell from an irregular character and an acme of $100\frac{2}{5}°$ to normal, and the pulse from 85 to 70, where they remained for a few days, presumably until the cerebrospinal fluid again formed in excess.

In Cases III. and IV. the temperature appeared to be that of a convalescent pneumonia.

The pulse frequency in Case I., a nervous young woman, averaged 110 to 120; and in Case II., a phlegmatic young man, it never exceeded 85 until he arose from his bed in his final convalescence. In Case III. it averaged 120 up to the supposed crisis, and then fell to normal synchronously with the temperature.

The respiratory rate in Case I. only once rose above 28 (32). It averaged 24. In Case II. it ran along the normal line. In Cases III. and IV., complicated with pneumonia, the respiratory rhythm and frequency varied with the pulmonary condition from 45 to normal.

We are able from these figures to draw but one conclusion, and that with due allowance made for temperamental differences, to the effect that the pulse rate tended toward a relative bradycardia rather than the tachycardia usually noted in the meningococcus infection. From the temperature and respiration records there is merely the irregular character of the febrile curve to be noted, and its tendency to fall to the normal in the early morning hours; also the constantly normal respiratory rate, when uninfluenced by complicating conditions.

The Skin. In Cases I., II., and IV. there were present a few rose-colored, typhoid-like spots upon the chest, abdomen, and back. These disappeared invariably soon after the beginning of convalescence. In none of the cases were petechiæ noted.

Case I. presented marked hyperæsthesia of the legs, and especially of the pretibial surfaces; the lower limbs were also decidedly hyperæmic for several days subsequent to admission to the hospital.

Herpes was absent in all the cases, except Case I.

Physical Examination of the Chest. The only abnormality occurred in the lungs and in the second pulmonic cardiac sounds of Cases I., III., and IV.

Case I. showed a fibroid condition of the right apex, certainly quiescent, and probably a healed tuberculous area.

Case III. was admitted to the hospital with consolidation of the base of the left lower lobe. Case IV., for a day or so, showed a small area of probable bronchopneumonic infiltration directly under the angle of the left scapula.

In all of these cases the second pulmonic sound was markedly accentuated, whether a pulmonary lesion was evident or not. The heart was otherwise normal.

The Abdomen. The abdominal examination was altogether negative. Neither the spleen nor the liver was enlarged nor tender to percussion or palpation in any of the cases.

The Cerebrospinal Fluid. Contrary to general experience in cases of pneumococcus infection the cerebrospinal fluid in three of these cases was perfectly clear. In one (Case II.) it was slightly turbid. I have seen also in meningococcus meningitis a number of cases in which the fluid was perfectly clear, the ward case already alluded to in this paper offering an example of this kind. It seems to me probable that the character of the fluid, whether purulent or clear, must depend more upon the virulence of infecting organism and upon the resistance of the individual than upon any definite rule of occurrence. It may well be, moreover, that early and complete evacuation of the infected contents may forestall a purulent inflammation of the meninges, and perhaps occasionally prevent a serous exudate from going on into purulent metamorphosis.

The Blood. It is worthy of notice that Case II., by all odds the most severe of the four, showed at first a normal leukocyte

count (5000), and later a relative increase to 10,800. Compared with the usual leukocytosis of cerebrospinal inflammation this is, of course, noteworthy, and may perhaps be ascribed to the same early relief of intracranial tension. Unfortunately no record was preserved of the leukocyte count in the other cases. There was also a slight reduction in the percentage of hemoglobin, and in the number of erythrocytes in the blood of Case II., but no other pathological changes than those usually found in mild infectious conditions.

The Urine. In all four instances the urine contained albumin in small quantities, as well as more or less microscopic sediment of renal origin, during the active stage of the disease.

Treatment. The treatment in all of the cases was identical, and consisted in the prompt withdrawal of all the obtainable cerebrospinal fluid, with the object in view of relieving intracerebrospinal hypertension. That the degree of pressure was excessive was evidenced by the forceful jet of fluid through the cannula, and by the amount of fluid obtained, in one instance considerably over one ounce.

The result was similar to that obtained in many cases of uremic hypertension—viz., almost immediate relief from the symptoms of intracranial pressure. In Case II. lumbar puncture was performed on two occasions, a week apart, and on both improvement was prompt.

In Case II. mercuric chloride and KI were employed for a time; and in Case IV. sodium iodide was used for a few days. No other medication was attempted. With rest in bed, a low dietary, and free purgation the result in all four cases proved favorable and the patients are now apparently well.

It is my conviction that these cases were all instances of mild infection, and that the treatment merely furthered an inevitable convalescence. On the other hand it would appear likely, from the positive reaction following thorough drainage of the cerebrospinal cavities, that the error of those who have heretofore found lumbar puncture unavailing may have rested upon the fact that too little fluid was withdrawn to afford a real or permanent light-

ening of the load. The fact must not be lost sight of that even when all has been removed it may re-form and re-collect, sometimes more than once prior to recovery.

Conclusions. 1. While not definitely proven, it is highly probable that at least three of these cases (I., II., and III.) were due to pneumococcus infection.

2. That pneumococcus cerebrospinal meningitis, while usually of serious and often fatal significance, may run a mild course and terminate favorably, even in a series of cases.

3. That thorough cerebrospinal drainage not only exerts a favorable influence upon the symptoms, but may render mild an otherwise grave condition.

4. It would appear possible from the study of these cases to conclude that the clinical laboratory findings (character of the cerebrospinal fluid, blood picture, etc.) may be fundamentally affected by early and complete relief of intracerebrospinal drainage.

DISCUSSION.

Dr. Frederick P. Henry: I consider it a remarkable fact, though a negative one, that pneumonia is not commonly complicated with meningitis. Weichselbaum has shown that the loose connective tissue of the mediastinum, as well as that surrounding the œsophagus and trachea, the tissues around the tonsil, at the root of the tongue, and even the conjunctive bulbi, are all in a state of acute œdema during the course of pneumonia, and that the fluids from these parts and the effusions into the cavities adjoining the nose, such as the antrum of Highmore and the frontal sinuses, contain the same micro-organisms as are found in the inflamed lung. These conditions are probably present in every case of severe pneumonia, and it is, therefore, a surprise, to me at least, that meningitis is not a more frequent complication of pneumonia. We all know how frequently *symptoms* of meningitis, especially in children, are present in pneumonia. All systematic writers upon this disease discuss the differential diagnosis between meningitis and pneumonia in children; and, in view of the pathological facts to which I have just alluded, it seems to me to be questionable whether these symptoms of meningitis in the pneumonia of children, symptoms usually ascribed to congestion or nervous irritation, are not, in more cases than we suspect, the result of actual inflammation.

Dr. Willson's cases appear to substantiate his view that pneumococcus meningitis is not so fatal as it is said to be by the authorities he has quoted.

Dr. J. Allison Scott: I should like to, without questioning the diagnosis in these three cases of Dr. Willson's, call attention to the reverse of Dr. Henry's picture; that every symptom and sign of meningitis can be practically found in cases of various affections and yet the meningitis be not present. I think the first case is not altogether secure, because of the bacteriological results. The second case does not seem to be at all proved to be a case of meningitis, because practically in every case active leukocytosis is a characteristic of the disease; even the tuberculous cases run a high leukocyte count. In the pneumococcic cases studied recently at the Pennsylvania Hospital the cerebrospinal fluid has usually been somewhat turbid, and the pneumococcus was demonstrated without difficulty and differentiated from other organisms by culture. I have had two such cases under my care—one of them fatal in twenty-four hours, and the second within a few weeks. The second case was the result of ear disease, and there had been no pneumonia at all. I therefore personally feel a diffidence in saying that a man has meningitis until it is proven by all means in our power. In a large percentage of cases of pneumonia the pneumococcus can be demonstrated in the circulating blood, if cultures are taken early; yet true meningitis is not common in this disease. Some cases which prove to be inflammation of the meninges of pneumococci origin are far removed from any infection in the lungs; therefore the micro-organism must have been derived from some other source than the pulmonary tissue.

Dr. Willson closes: Both Dr. Henry and Dr. Scott have raised an interesting point in regard to the presence of pneumococci in the circulation. I do not know whether either one has seen the article by Cathelin, 1903, in which he claims to have demonstrated that there is a constant circulatory intercommunication between the cerebrospinal fluid and the blood stream through lymph channels. Still another observer (Christy) has noted the variable appearance of the lower parasitic forms (trypanosomes) now in the blood, and again in only the cerebrospinal fluid of the same case and on the same day.

The study of cerebrospinal meningitis has been especially interesting in connection with some studies which I have made with reference to the pressure of the fluid and its direct bearing upon the symptom-complex of both uræmia and meningitis.

The possibility of a criticism of the diagnosis had not occurred to me. In the two cases suggested by Dr. Scott (Nos. I. and II.) the meningitic picture appeared unusually complete. There was an enormous amount of cerebrospinal fluid in each case; in Case I. about an ounce; in Case II. considerably over an ounce of clear fluid, with symptoms indicative of intracerebrospinal pressure. In the second case, also, there was a severe double optic neuritis, which still persists. There was photophobia, delirium, intense headache'

ptosis of the left eyelid, temporary bulbar paralysis, loss of all reflexes, and their reappearance after the relief of intracerebrospinal pressure, Kernig's and Babinski's phenomena were present, and diplococci, resembling pneumococci, were present in the cerebrospinal fluid. The case, moreover, occurred in the midst of an epidemic of cerebrospinal meningitis. If nothing else the optic neuritis would suggest a basal meningitis, and, there being so much of the meningococcus and pneumococcus infection extant, the diagnosis seemed more than warranted, even had the offending organisms been absent from the cerebrospinal fluid.

I feel that the most interesting case of all was the third, one of pneumonia, with meningitis in a boy, in whose cerebrospinal fluid pneumococci were found. Dr. William E. Hughes has raised the question whether in all pneumonias the cerebrospinal fluid may not show the pneumococcus, and we are now doing lumbar puncture in all cases of pneumonia to determine the point. If pneumococci are found in every such case it will lessen the importance of the bacterial findings. In the fluid from a recent case of meningitis, following dislocation of one of the cervical vertebræ, we recently found staphylococci, although the meningitis was doubtless due to internal traumatism.

On these grounds one might perhaps question every bacteriological diagnosis of meningitis. If the diagnosis is questioned, however, it must be upon this ground alone, when the symptom-complex is as complete as in the instances submitted.

A FATAL CASE OF BACILLUS PYOCYANEUS SEPTICÆMIA AFTER SURGICAL OPERATION.[1]

By JOHN B. ROBERTS, M.D.

Study of a recent death after a plastic operation for cicatricial deformity of the arm has caused me to make the diagnosis of septicæmia from infection with the bacillus pyocyaneus. Such general infection in the human subject is not common, and this instance, therefore, seems to deserve record. It is unfortunate that the diagnosis was not confirmed by bacteriological examination, but the local and general symptoms and a bacteriological study of the blue pus developing in a patient under my care, subsequently, in the same institution, make the diagnosis fairly certain.

The patient developed during convalescence from an operation, which left a large superficial wound of the shoulder, a series of symptoms which I could not understand. At first I thought the child had amygdalitis and bronchitis, due to epidemic influenza, and that the bad condition of the wound was due to impaired circulation in the flap of skin and to imperfect asepsis, permitting ordinary pyogenic infection. Then the possibility of typhoid fever was carefully considered and a blood test made, with the result that such a diagnosis seemed untenable. Malarial fever was similarly discussed and rejected. When the patient later developed symptoms of a toxic nephritis, with ascites and intrathoracic inflammation, and finally died, I came to the conclusion that some form of septicæmia, unfamiliar to me, had

[1] Read June 7, 1905.

occurred through infection of the operative wound of the shoulder and axilla.

While I was feeling distressed over this unfortunate death from an operation of no real gravity I happened to read an article on septicæmia from general infection by the bacillus pyocyaneus, published by Drs. J. R. Eastman and T. V. Keene, of Indianapolis, in the *Annals of Surgery* for November, 1904. I was at once struck with the resemblance of my patient's symptoms to those ascribed to this micro-organism.

About six weeks afterward, while making a ward visit, I requested the resident surgeon to remove the dressing from a convalescing patient, upon whom I had operated by incision for pyothorax. To my surprise I saw that the pus-soaked gauze was greenish-blue in color. Inquiry disclosed the fact that for a number of months the resident surgeons had been seeing similar staining of wound dressings in a variety of cases. I suggested the possibility of the presence of the bacillus pyocyaneus, and ordered the dressing, which I had just seen, examined bacteriologically. The laboratory report showed the discharge to be infected with the bacillus pyocyaneus in pure culture. That the infection occurred in the institution is established by the fact that the pus evacuated when I opened the man's chest had no special blue tint and contained cocci only. Additional evidence is the circumstance that a number of other cases in the hospital before he was admitted showed blue pus. For some reason neither we, the attending surgeons, nor the resident surgeons had laid any stress on the occurrence of blue-tinted discharges in the wards. It is possible that none of the former had seen the dressings, and that the latter had not thought the matter of sufficient importance to call the attention of us, their chiefs, to it. When the wound in my case of plastic operation of the shoulder began to do badly and slough I was told that the skin looked greenish. This I, however, thought to be due to the gangrenous inflammation, which was destroying the integument. I occasionally looked at the wound, but did not examine carefully the removed dressing.

The clinical history of the fatal case of general septicæmia, probably from infection with B. pyocyaneus, is as follows:

Georgie C., a colored girl, aged nine years, was admitted to the hospital on November 18, 1904, for operation to relieve a cicatricial deformity of the left arm due to a burn. The contracted scar tissue obliterated the axilla and tied the upper arm to the chest by a fibrous band. Her general health was good, the urine was normal, she took ether satisfactorily, and stood the long plastic operation well. Convalescence was uneventful. No suppuration took place, no sepsis occurred, the appetite was good, and the urine continued to be normal. During the following three weeks some sloughing of the flap, turned into the axilla, occurred and the raw surface furnished a greenish, serous discharge, which was not purulent. Ten days later the clean, granulating surface was covered with skin shavings taken from the child's thigh under ether anæsthesia. About the time of these occurrences at least one other case of greenish secretion from a wound was observed in the hospital, as had been several others during the few previous months. Because there was no rise of temperature and no purulent discharge the wounds in these cases had been considered by the resident surgeon to be doing well and no special comment was made about the greenish tint of the secretion.

On January 9, 1905, my colored patient's temperature suddenly rose to 102.4°, and she became sick, with enlarged tonsils and a congested throat. A blood examination showed hæmoglobin, 65 per cent.; leukocytes, 14,500; erythrocytes, 3,350,000. In four days the temperature was normal again; the urine was still free from albumin and sugar, and the girl had returned to her usual condition. A week later a second plastic operation was done to liberate the arm still more. There was left a large open wound in the deltoid region, from which a flap of skin had been dissected to be turned into the armpit. This was not covered with skin grafts, but left to granulate, with the intention of grafting it later. The patient came out of ether promptly, but the next day had pulse, 136; respiration, 32; temperature, 102.4°. Moist rales were heard in both lungs posteriorly and there was slight cough. A little pus subsequently appeared about the margins of the flap and there was some sloughing of its edges, but nothing of special moment, except the bronchitis, occurred. There was a moderate febrile movement in which the temperature ranged from 100° to 101°, the respirations from 24 to 28, the pulse from 92 to 116. The patient was now, as she always had been, nervous and easily excited, especially when the wound was dressed. This was attributed to the way she had been humored at home, when, as a little child, she had been recovering from the serious burn which caused the deformity. Gradually the temperature oscillation increased until it extended through about 3°, with 102° as its highest point. The wound did not do well and the margins of the granu-

lating surface were once touched with a stick of silver nitrate. It was a new stick and not one which had been applied to another wound. The secretion dissolved some of this salt and, trickling down the side of the chest, made a more extended application than was intended.

Dr. J. D. Butzner, the surgical dresser, whose careful notes furnish the basis of this report, records that two days afterward, or about three weeks after the second operation, the sloughing process was spreading and the secretions and tissues had a greenish color. He thought that possibly the increased unhealthy condition of the wound was in some way due to the action of the silver nitrate. His suspicion was, however, founded on no other evidence than that the wound continued to assume a more and more unfavorable appearance. Temperature, 99° to 102°; pulse, 96 to 120; respirations, 22 to 28. A few rales, sonorous in character, were still to be heard in the lungs. A couple of days later the temperature reached 104°; pulse, 146; respiration, 28. The sloughing was spreading and there was redness for about an inch around the margins of the ulcers of the axilla, arm, and back. By this time the cicatrices on the chest and back from the former operation had broken down. There was marked tenderness of the sloughing region, but no raised œdematous swelling, as in erysipelas. Having had in my mind the possibility of typhoid fever, I had my colleague, Dr. James H. McKee, examine the patient. His thorough examination, as well as the report of a test made for the Widal reaction, dispelled the idea of typhoid infection. The patient's tongue was heavily coated and her breath offensive. The lymph nodes in the postcervical, submaxillary, inguinal, axillary, and epitrochlear regions were enlarged. Those in the right axillary and epitrochlear regions were most palpable, though the wound was on the left side. The pupils responded well to light; the nasal breathing was free; the heart and lungs revealed nothing of particular importance, except overaction of the heart; the border of the liver in the midaxillary line was about three-quarters of an inch below the costal margin; the spleen was not palpable, nor did it have any increased area of dulness, and the abdomen was flat and not unduly tympanitic.

A day later some vesicles were noticed in the region of redness about the margins of the wounds. There was, however, no spreading elevation of the skin due to œdema, as is seen in the streptococcus infection, which is ordinarily called erysipelas. The redness was noticeable, of course, only where the black pigment of the negress was absent or diminished in the scars of the former operation. The epidermis in the inflamed area became detached from the underlying skin in the region of sloughing. Now for the first time, after many analyses, the urine was found to contain albumin. There were some epithelial cells seen, but no casts were discovered and no sugar was present. The specific gravity was 1006; pulse, 112 to 120; respiration, 24 to 36; temperature, 100° to 102°. The girl lost flesh, was very nervous, had pale mucous

membranes, coughed slightly, and had slight irregular fever; temperature dropped now to about 99°, respiration was from 20 to 24, and the pulse 92 to 116. Analysis of the urine made later showed that it still contained albumin, and granular and hyaline casts were found. During this period the temperature once rose to 104.2°. For a couple of days improvement took place, but the child again became worse.

Considering that the irregular temperature might be due to malaria, the blood was examined for the malarial organism, but the result was negative. During this long period of illness various applications were made to the wound. Sterile salt solution and aseptic dressings were varied with ointments containing carbolic acid and irrigations of solutions of potassium permanganate and formaldehyde in the attempt to destroy any local infecting agent. The internal treatment was of a tonic and stimulating type.

The wound gradually improved greatly in appearance, the sloughing ceased, and the granulations became healthy, but the girl's general health remained bad. The possibility of tuberculosis was considered, but rejected. The lips and other mucous membranes were very pale; the eyelids and cheeks became œdematous; the heart's action was irregular and rapid; there was some pain in the right chest; temperature ranged from normal to 101°; pulse from 100 to 116; respiration 24 to 28, and the child became very weak and nervous. Early in March the œdema of the face increased; the abdomen contained fluid; vomiting occurred frequently. It was evident that a toxic nephritis was present. Remedies to increase the amount of urine and cause sweating were employed. She cried a great deal, slept very little, and was, perhaps, more nervous. She after a time became delirious, though she had no headache; the pulse was weak and rapid; bowels seemed looser than could be accounted for by the remedies administered, and she complained of right-sided pain. The urine had a specific gravity of 1026, contained granular casts, cylindroids, amorphous urates, and albumin. It was acid in reaction, but contained no sugar. The blood examination at this time showed hæmoglobin, 45 per cent; leukocytes, 24,000; erythrocytes, 1,980,000. Temperature was normal or subnormal; pulse, about 100; respiration, about 24. A few small skin grafts were taken from her father's arm and applied to the healthy, granulating surface, which was now healthy.

Toward the middle of March the albuminous urine contained blood cells and blood casts in addition to the granular and hyaline casts. The physical signs showed that there was a pneumonia or pleuropneumonia of the right lung, and the temperature then rose to above 102°. Death occurred rather suddenly on March 16th. No autopsy could be obtained.

The cause of this patient's symptoms was evidently a general infection, or septicæmia of some sort, occurring about the first of

the year. Previous to this time she had been well after the original operation, except that there had been some sloughing of the flap sutured into the axilla, and that this sloughing was accompanied by a greenish secretion. No general symptoms of importance, however, were exhibited, and the wound became so healthy that it was skin-grafted. Then followed the sudden amygdalitis, with lowered hæmoglobin, a marked leukocytosis, and a diminished number of red blood cells. This seems to have been the starting point of her fatal illness. It is true that in a few days she apparently recovered from this acute condition and was therefore subjected to a second plastic operation under ether anæsthesia. The bronchitis, which promptly occurred after the operation, may have been directly due to infection of the lungs from an incompletely cured tonsillitis, or a very mild bronchitis may have awakened into activity as the result of inhalation of ether. About three weeks after the second operation it was that the secretion from the sloughing wound was noticed for the second time to be of a greenish color. From this time until her death the child was evidently suffering from some form of general infection. The greenish tint of the wound secretion, which was noticed twice, the existence before and after the time of this patient's illness of cases of blue pus in the wards of the hospital, and the general symptoms exhibited by her have led me to the belief that the infection was probably due to the bacillus pyocyaneus. It is unfortunate that I did not have a bacteriological examination made, but this was overlooked.

Some weeks later I observed in a case of pyothorax, which I had incised and drained, that the pus escaping from the drainage tubes was greenish blue in color. This pus was examined by Dr. Guthrie McConnell, who reported that it was decidedly greenish in color and showed numerous leucocytes and some rather thick bacilli. An agar culture was made, which gave the bacteriological and microscopic evidence that the bacillus pyocyaneus was the organism present. Two previous bacteriological examinations of the pus from this same patient, obtained at the time of operation, showed simply staphyloeocci and diplococci.

Although the appearance of the wound did not suggest erysipelas to me, it is possible that in the local infection the bacillus pyocyaneus was mixed with the streptococcus of erysipelas. At the time that I discovered the blue pus in the man with pyothorax there occurred one or two cases of erysipelas, or streptococcus infection. The case which I saw was not very severe locally, but developed a toxic nephritis as one of its symptoms. The man who had nearly healed ulcers of the legs, the result of a previous burn, was quite sick for a time, but recovered without any special prolongation of illness. The black skin of the patient, the subject of this report, may have been a factor in disguising the erysipelatous inflammation if it existed. I and the resident surgeon as well, however, believed that there was no spreading œdematous elevation of the skin in the colored girl such as we expect to see in erysipelas. An attempt was made to secure a bacteriological examination of the blood of the man with erysipelas, but on account of a temporary difficulty in having laboratory work done no report was obtained.

A rather careful study of the literature of pyocyaneus septicæmia and of the cases reported has led me to make the clinical diagnosis of septicæmia from the blue pus bacillus. The cases reported show a very great variety in the symptoms attributed to this infection. In quite a number of instances the infection was proved to be a mixed one. The apparent irregularity of symptoms in pyocyaneus disease in the human subject is quite probably due to this fact.

Macé[1] says that infection by B. pyocyaneus presents two types—the septicæmic and the cutaneous. He states that the cutaneous form is more rare in man than the septicæmic form, and is characterized by bullous eruptions and multiple ulcers. The septicæmic form is a true septicæmia with fever, albuminuria, hemorrhages, endocarditis, and the usual symptoms of a general infection. The digestive tube is particularly liable to show lesions, such as diarrhœa, enteritis, dysentery, and gastritis. The pulmonary manifestations noticed have been bronchopneu-

[1] Traité de Bactériologie, 5th edition, 1904, p. 956.

monia and pulmonary gangrene. The cases of local infection reported are many. Blumer[1] reported a case in which this organism had apparently caused an acute sore throat, with the clinical characteristics of diphtheria. This case has interested me very much because my patient developed the serious septicæmic symptoms after a quite sharp attack of inflammation of the tonsils and throat. Kuhnau[2] found the organism associated with influenza. The facts that the organism is found in the normal state of man in the intestinal canal and is very common in the dust of the streets and in polluted water make infection of the throat and of wounds not difficult.

Brill and Libman,[3] in their report of a case of B. pyocyaneus septicæmia occurring secondarily to staphylococcus infection of the blood, review the recorded cases up to that time. They say that the nervous symptoms described in infected animals have not been noted particularly in man, except in a case reported by Jadkewitsch. This statement seems to me important, because the nervous symptoms in my patient were not marked. The report which I have made shows also an absence of the hemorrhagic tendency which has been noted in a number of cases. The urine toward the end of the patient's life showed blood casts and blood cells. This is the only evidence of a tendency to escape of blood from the vessels. An autopsy might have shown other hemorrhagic lesions. The case reported by Brill and Libman showed an even greater diminution of hæmoglobin and red blood cells, due to the secondary anæmia, but there was the same tendency to enlarged lymphatic nodes, enlarged liver, and high temperature. There was apparently no eruption in the case which I have recorded, though it is possible that the black skin may have prevented our seeing slight changes in the color or condition of the integument. The condition of her wound resembled very much that described in the case reported by Eastman and Keene, already mentioned.

[1] Johns Hopkins Hospital Bulletin for 1895.
[2] Zeitsch. f. Hygiene, 1897, vol. xxv. p. 492. (Quoted by Macé.)
[3] Am. Jour. Med. Scienes, 1899, vol. cxviii. p. 153.

Horder's case,[1] following infection of the ear, showed a high leukocytosis, rapid emaciation, delirium, and paraplegia, followed by sudden death. There were small abscesses in the lungs and within the spinal membranes. These abscesses contained brilliant-green pus, cultures made from which showed a pure growth of B. pyocyaneus. The clinical features, according to this writer closely resembled those of typhoid fever. The statement made by some writers that septicæmia from this organism usually gives a normal or subnormal temperature does not seem to be substantiated by the reports of the cases which I have found.

Chassot[2] reports a case of this form of septicæmia occurring subsequent to a puerperal mastitis. The septicæmia was a mixed one, or at least the pyocyaneus infection was preceded by the presence of staphylococci. His patient had symptoms which were not very marked at first and were supposed to be due to a slightly sore throat. The case seems to resemble mine in so far as there is a possibility of infection having occurred through the tonsils. The woman, as in my case also, had a period in which she seemed to recover from the symptoms of general malaise and soreness of the throat, and then developed symptoms of the septicæmia, which was followed by death. In this instance the fatal issue seemed to occur as the result of great bleeding, due to an amputation of the breast made in an effort to remove the focus of suppuration. The postmortem examination gave evidence of a widespread septicæmia, and bacteriological examination proved the existence of staphylococci and B. pyocyaneus.

The variation in symptoms may be due, perhaps, to the fact that there are two varieties of the B. pyocyaneus if the observations of Ernst are correct. The fact that some cases were acute and some chronic, and that many of them have been associated with infection by other micro-organisms, also adds to the difficulty of establishing with accuracy the symptoms that are to be expected in the human subject.

[1] Trans. Pathological Society of London, 1904, vol. lv. p. 140.
[2] Bull. Soc. d' obstét. de Paris, 1904, vol. vii. p. 160.

Barth and Michaux[1] state that in infections of the urinary bladder the B. pyocyaneus seems to become very much more virulent if it be associated with another species of micro-organism.

Lartigan[2] has written a very interesting paper, in which he records three cases. He calls attention to the fact that the organism under consideration may not produce the blue pigment for some days, and perhaps not at all, until it has passed through animals. This is another reason that some of the cases of obscure disease may not have been attributed to this organism, although it was really the causative agent.

It seems to me that, after studying the cases which I have found in literature and reading the list of symptoms due to pyocyaneus septicæmia given by Kolle and Wassermann,[3] I am justified in believing the case reported in this paper to be an instance of general infection by the B. pyocyaneus. Unfortunately a doubt exists which cannot be disregarded, because no bacteriological examination of the blood or internal organs, or even of the secretion of the wound, was made. The occurrence in the hospital at about the same time of local infections of patients with the blue-pus bacillus and with the erysipelas streptococcus also complicates the diagnosis. It must be remembered, however, that, as recorded, the blue pus was found on the dressings on two occasions a considerable time apart, and that the discoloration continued for some time; that the typical elevated swelling of erysipelas was not found, and that the profound toxemia, with great secondary anæmia and death, are not the usual occurrences in erysipelas.

[1] La Presse médicale, 1903, vol. x. p. 405.
[2] Philadelphia Medical Journal, September 17, 1898, p. 562.
[3] Handbuch der Pathogenen Mikro-organismen, 1903, vol. iii. p. 486

DISCUSSION.

Dr. J. 'Alison Scott: Not all cases of infection of that type, even though they be severe, are necessarily fatal. I recall a case in which Dr. Baldy had me look after a couple of years ago. It was that of a woman practically exsanguinated by extrauterine pregnancy. She refused operation until she was almost dead. When the abdomen was opened the diagnosis of extrauterine pregnancy was confirmed, but she was practically moribund. She was given salt solution in all parts of her body, especially underneath the breasts. In about ten days she developed a severe infection under the right breast, which was proved to be pyocyaneus in origin. There was great swelling in the immediate neighborhood of the salt solution injection, with free discharge of greenish-blue pus. The pain complained of was severe; simple inversion and drainage did not cure; necrosis of two ribs occurred, and cure resulted after their removal. All the difficulty was entirely local. The woman recovered and developed a second tubal pregnancy of the other side the following year. Dr. Baldy removed that and she is living to-day.

TWO CASES OF PARACENTESIS OF THE PERICARDIUM.[1]

By JOHN B. ROBERTS, M.D.,
PROFESSOR OF SURGERY IN THE PHILADELPHIA POLYCLINIC.

The glory of modern surgery can be appreciated only by practitioners who, in their youth, were familiar with the almost universal occurrence of operative sepsis. Surgical timidity, due to "inflammatory fever" and its results, made the experienced surgeons of our youthful days skeptical of the opinions of those of us who saw the coming of the new era.

The contention that trephining was not a serious procedure and ought to be adopted in nearly all fractures of the cranial vault[2] aroused opposition, and the advocacy of suprapubic cystotomy in preference to perineal incision was regarded as foolishness.[3]

So it was with my proposition that the diseased pericardium should he treated as the pleura in similar pathological conditions. That the pericardium should be promptly aspirated (1876), if it contained a serous or hemorrhagic effusion unaffected by the administration of drugs, and that it be kept empty by incision and drainage (1876), if the fluid contents were purulent,[4] was doubted. These procedures are now routine operations. It then seemed hazardous to incise the chest wall and pericardium to clear up a doubtful diagnosis of dilated heart or pericardial effu-

[1] Read May 4, 1904.

[2] Roberts, Operative Surgery of Human Brain, Transactions of the American Surgical Association, 1885.

[3] Roberts, Transactions of the American Surgical Association, 1884, p. 169.

[4] New York Medical Journal, December, 1876.

sion (1881).[1] The advocacy of heart suture as a therapeutic procedure for wounds of the cardiac wall (1881 and 1883) seemed in 1882 to be a youthful indiscretion, if one could judge from the tone of the Fellows of this College.[2] A formal method of attacking the pericardium and heart by a trap-door resection of the costal cartilages, devised in 1897,[3] was, however, the outcome of these studies.

This obstructive conservatism is, however, the usual attitude of mind of the middle-aged; and surgeons of that period of life need to bear in mind that most of what the profession learns is taught by young men.

To-night several cases of pericardiocentesis and of pericardial drainage have been reported, and two Fellows, Dr. John H. Gibbon and Dr. Francis T. Stewart, have each added to surgical

Roberts' pericardial aspirating trocar, consisting of a hollow needle and an internal cannula with flexible end.

literature an instance of heart suture for penetrating wound. In Dr. Stewart's case the patient recovered.[4] I feel honored that both are ex-resident physicians of the Polyclinic Hospital.

Through the courtesy of Dr. David Riesman I recently had the opportunity of aspirating the pericardium in two patients with pericarditis, and desire to join him in the record of the cases. Both were tapped with the pericardial aspirating trocar devised and described in 1877 and 1881.

Case I.—The patient, a colored woman, had been admitted to the Polyclinic Hospital the day before with pericarditis and bronchopneumonia.

Tapping was done March 9, 1904, at 6 P.M., in the fourth left interspace over the apex beat, which could be distinctly felt. The point of puncture was about three and one-half inches to the left of the middle line of the sternum,

[1] Annals of Anatomy and Surgery, December, 1881, p. 250; Medical News, January, 13, 1883.
[2] Transactions of the College of Physicians of Philadelphia, 1883.
[3] The American Journal of the Medical Sciences, December, 1897.
[4] Dr. Gibbon has recently had another case of heart suture. The patient recovered.

under the left mammary gland, and perhaps through its lower edge. The Roberts pericardial trocar was employed and worked satisfactorily, the vacuum of the aspirating pump being attached after a little fluid had flowed from the trocar. The introduction of the needle, which was made without attaching the aspirator, was followed by pushing forward the internal cannula. The trocar was introduced to a depth of about 3½ cm. The point gave the impression of being within a cavity, and the beat of the heart against it was easily felt. The external portion of the trocar oscillated with the cardiac pulsations. Three ounces of a very bloody serum were drawn off. That this was not pure blood was shown by the lightish color and the yellow-red stain made on the towels when some drops soiled them. In order to make a strong vacuum, after the small bottle was about half-filled, the aspirating apparatus was detached. The contents of the bottle had coagulated so promptly that it took a little time to wash out the bottle and to obtain some of the fluid in sterile test-tubes for bacteriological examination. The aspirator was attached to the trocar again, but no further fluid was obtained. When the aspirating apparatus was detached there was a rush of air into the bottle, showing that a vacuum had been properly obtained. No air flowed into the chest, as the trocar on being withdrawn was found to be plugged with a clot of bloody lymph.

The wound was sealed with collodion and cotton. I thought it not wise to withdraw the inner cannula to remove any possible plug, because this would have left the sharp point of the needle exposed and liable to lacerate the heart wall.

Percussion over the upper cardiac region after the patient had been tapped showed clearness where previously there had been dulness. The woman, after the operation, seemed to breathe more easily, and had a better pulse. She was somewhat excited during the operation, but did not seem to suffer much real pain. Ethyl chloride was used to freeze the skin before the puncture was made.

Before the operation there was dulness of the right chest posteriorly, with moist rales. There was marked dulness over the heart. The dull area was somewhat irregularly triangular, with the base downward. This dulness extended into the left axillary region. The dull area seemed to be displaced forward when the patient turned on the right side. The cardiac sounds and impulse were quite distinct in front, and a friction sound was heard at the base of the heart. This was said to be less than on the previous day. The cardiac sounds were heard posteriorly. There were some rales posteriorly in the left chest. The patient was breathing very rapidly and had a weak, frequent pulse, but was able to lie flat on her back even before operation. The day after operation she was in better condition than on the day of operation, and the cardiac dulness, which had been diminished by operation, was not increased.

On March 12, 1904, at 12.30 P.M., it was determined to make another aspiration, because the pericardial sac had evidently refilled. A puncture was made with the Roberts trocar in the fifth interspace, two and three-quarter inches to the left of the middle line of the sternum. The aspirator pump was attached, but nothing was obtained except a very few drops of bloody fluid. The trocar was then withdrawn and found to be plugged. A second puncture was then made in the same interspace, three and three-quarter inches from the midline of the sternum. The puncture made a few days previously had been made, in the interspace above, three and a half inches from the midline of the sternum and through the lower portion of the breast gland. The second puncture, made to-day, obtained by aspiration four and one-half fluidounces of dark, bloody fluid. The fluid was much darker than that obtained a few days ago, and did not coagulate so quickly as that did, if it coagulated at all. It was thicker than the previously obtained fluid. The trocar moved with the heart beats in both punctures to-day, but not so vigorously as it did on the former occasion. At the last puncture the trocar was buried in the tissues about 9 cm. The hand of the operator received the impression that the point was in a large cavity. At the first puncture the end seemed not to enter a large cavity, but to strike against some solid body within the chest. An increased resonance was obtained by percussion of the precordial region after the operation. The patient died early the next (?) morning.

The autopsy showed the pericardial cavity nearly free from fluid; the heart was covered with shaggy lymph, particularly about its base, and there were adhesions between the heart and pericardium. The punctures in the chest wall were in the fourth and fifth interspaces, and the first puncture made on the second day scraped or went through the edge of the costal cartilage above the space.

Upon the front of the heart was a small ecchymosis without apparent wound, that looked as if it might have been caused by contact with the end of the trocar. This fact could not be definitely confirmed, as the point of ecchymosis was not very marked. There was a considerable amount of fluid in the left pleural cavity, and a condition of pleuropneumonia. There was some congestion and consolidation of the right lung.

Case II.—Colored man, aged thirty-one years, in the Polyclinic Hospital under Dr. Riesman. Admitted on March 22, 1904; died on March 28, 1904.

On March 24, 1904, at 11 P.M., I found an enlarged area of cardiac dulness, and valvular murmurs present and easily heard. The apex beat was seen and felt under the left nipple. I did not believe there was much fluid in the pericardium, though the dulness extended to the right of the sternum. Heart was supposed to be enlarged. Some dulness of the right chest existed posteriorly, with some harsh breathing. At the right base posteriorly there was heard what seemed like pleural friction, but I was uncertain whether it was not rales.

Left chest posteriorly showed some dulness. The question in my mind was whether the pulmonary congestion was secondary to the heart lesion, or whether an old cardiac valvular disease had the pulmonary condition added to it and was causing weak pulse (130?), rapid respiration, sweating, and dyspnœa. The man was not sitting up to breathe. I decided that there was not enough fluid in the pericardium to justify tapping. I had not the benefit of Dr. Riesman's presence to aid me in the diagnosis.

Dr. Riesman sent word on March 25th that he thought tapping was desirable, but could not stay to the operation. I saw the patient and found the condition to be about as the day before, but more dulness in the cardiac area appeared to be present. I tapped in the fourth right interspace close to the sternum with Roberts' aspirating trocar, not attached to the vacuum until after insertion. Three fluidrachms of slightly reddish fluid were obtained. The trocar did not move with the heart, but with respiration.

I then punctured in the fifth left interspace directly over the apex beat, about one and one-half inches below the nipple, as it seemed desirable to be sure there was no large effusion overlooked. The end of the trocar seemed to strike the heart and perhaps to be embedded in the heart muscle, because it moved with such vigor with the heart beats. No fluid, except a few drops of blood, escaped. The pump brought very little fluid, and, after repeated attempts to get fluid, the instrument was withdrawn. Attempts were made to obtain fluid by altering the position of the end of the cannula, but none was obtained. The end did not feel to be free in a cavity of any size. The end of the cannula contained blood clot, and there was a free flow of blood from the wound until it was closed with cotton and collodion. The patient at one time complained of severe pain, and it was then that the operator felt that the heart had been wounded.

The next day the patient seemed better; the pulse was stronger, and it was thought that the area of cardiac dulness on the right of the sternum was less.

Patient died on March 28th. Autopsy showed no pleural effusion; no fluid in pericardium, but marked amount of lymph in pericardium. The heart was greatly hypertrophied. No mark was found of wound of heart, but this would probably have been concealed by lymph deposits.

REPORT OF A CASE OF HYPERNEPHROMA.[1]

By WILLIAM J. TAYLOR, M.D.,
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On June 6, 1904, I saw, with Dr. Wharton Sinkler, a man aged forty-four years who complained of pain in his back, abdomen, and legs. For the past year he had been failing in health, and during this time had lost over fifty pounds in weight, but had continued to work in his office until April. There was no tuberculous, malignant, or specific history, nor any recollection upon his part of injury. When I examined him he was complaining of pain in the lumbar region, and there was distinct rigidity of the lumbar spine. There was no abdominal tenderness, but he was extremely ticklish, and the slightest manipulation made the abdominal wall rigid. There was no dulness on percussion, as the intestines floated over a growth occupying the whole of the upper, outer quadrant of the abdomen. This was very large, nearly the size of a child's head, and had a distinct outline, particularly on its inner side, and was somewhat movable. It was undoubtedly a tumor of the kidney.

The urine was free from any evidences of disease; there was no albumin, no casts, and no blood, nor was there any history of his ever having passed bloody urine. The urine was being secreted in large quantities, with a specific gravity of 1020 to 1024. There were no evidences of bladder irritation, although he arose once at night to pass water; but as the kidneys were

[1] Read November 1, 1905.

acting very freely this might account for this last symptom. He ate well, and after rest in bed his pain gradually diminished, and he was soon weaned entirely from the regularly taking of morphine, which up to this time had been necessary to give him relief. It was necessary, however, while in bed for him to be propped up on several pillows, as he could not lie flat on his back without great discomfort.

His hæmoglobin was 80 per cent. and the red corpuscles 4,500,000.

An *x*-ray examination was negative.

He grew rapidly worse; the pain increased and the tumor enlarged. After consultation with Dr. J. B. Deaver, Dr. M. Newberry, and Dr. Sinkler an operation was advised, and he therefore entered the Orthopædic Hospital on June 28th. Within the next twenty-four hours he passed eighty ounces of urine, with a specific gravity of 1020. It contained no pus, blood, albumin, or sugar, but a few granular casts were found after the urine had been centrifuged for fifteen minutes.

On June 29th I operated by making an incision in the left loin and extending this forward almost to the border of the rectus muscle and exposed an enormous tumor of the kidney. The capsule was stripped off with some difficulty, the veins being enormously distended, and on account of the size of the growth it was necessary to make a second incision, extending up to the border of the ribs. The growth extended well up under the ribs, down into the pelvis, and over toward the middle line. The peritoneum was torn in two places, but these were clamped with forceps and subsequently closed with catgut. It was impossible, owing to the size of the tumor, to get at the ureter and vessels to ligate them, but they were clamped and the kidney and tumor rapidly enucleated, and the vessels and ureter cut through and a large, stout, silk ligature used to tie the stump of the vessels and ureter in one mass.

There was considerable shock, and a pint of salt solution was introduced into a vein and he was given one-tenth of a grain of strychnine in two doses hypodermically.

There was comparatively little hemorrhage for such a grave operation, as all bleeding parts were secured by ligatures. Two long pieces of sterilized gauze were packed lightly in the wound, and it was then partly closed with through-and-through silkworm gut sutures.

FIG. 1

Hypernephroma, showing the relation of the tumor to the kidney. Weight, 6¼ pounds.

He reacted very nicely from the operation and did not vomit. It was not necessary to change the dressing for about eight hours, when it was pretty thoroughly soaked with bloody serum; but he had to be given much more morphine than would have seemed wise under ordinary circumstances. By the next day he began to take some peptonized milk, drank freely of water, and

the kidney acted well, as in twenty-four hours there were 24 ounces of urine withdrawn by catheter.

The tumor, when it was removed, weighed 6½ pounds, was 10 inches long in its longest diameter, 7 inches across, and 5 inches thick. It was sent to Dr. W. T. Longcope, of the Pennsylvania Hospital, for examination, who reported it to be a hypernephroma, and gave this detailed report:

The specimen has been preserved in formalin. It consists of a huge, irregularly lobulated mass somewhat oval in shape and measures 20 cm. in its longest diameter. It weighs 2150 grams. The surface, although quite irregularly lobulated and at one extremity covered with adhesions, is rather smooth, and the mass appears to be encapsulated. At one end the remains of a kidney can be seen. The two poles are well preserved and the surface appears granular. From pole to pole the kidney measures 14.5 cm. The tumor seems to arise from the central portion of the organ. It involves almost the entire dorsum, an area about 6 cm. in length on one lateral surface, and the entire portion of the other lateral surface, from which it bulges out considerably. On this side the growth extends directly into the pelvis, which is bulged, and measures about 5.5 cm. in length. On section the position and nature of the growth become clearer. Springing practically from the hilum of the kidney there is a large growth. At the sides the kidney substance, showing practically normal markings, surrounds the growth, thinning out into a narrow capsule as the tumor widens. The tumor is apparently everywhere surrounded by a capsule. The central portion is made up of blood clot, with here and there bright-yellow pigment. About the extreme margin and at the pole opposite to the kidney the growth appears to have some structure. It is made up of irregular spaces filled with what looks like innumerable minute papillomatous processes tightly squeezed together. The color is white.

Occasionally these spaces appear to be degenerated and partially filled with blood. They were always best preserved about the periphery.

Sections are made from various parts of the tumor mass. The tissue is not well preserved and the cells are much shrunken.

Kidney. There is a fairly well-marked and diffuse increase of connective tissue throughout the cortex. In these situations there are many small, round cells, and the tubules show atrophic change. Hyaline casts are quite numerous. The convoluted tubules are large. The epithelium is granular but usually very much shrunken. One or two of the tubules contain large, irregular cells filled with brown pigment. The glomeruli are slightly injected. A few show thickened capsules.

Section from Tumor. Sections from all portions of the cortex show the same structure. Toward the central portion part of the tissue becomes necrotic.

Sections from the central red mass are composed of necrotic material, blood, and brilliant orange-colored pigment in amorphous granules, or small spicules. In all sections made through the periphery the tumor is surrounded by a connective-tissue capsule of unequal thickness. It shows very few cells. The growth is arranged as masses of cells of unequal size, separated by connective-tissue trabeculæ carrying bloodvessels. From these coarse, fibrous trabeculæ delicate strands of connective tissue and bloodvessels run throughout the compact masses of tumor cells. The growth is composed of large, irregular polygonal cells closely packed together. The protoplasm shows extreme vacuolization, so that frequently it is only possible to make out a limiting cell membrane and a nucleus placed usually in the centre of the cell. The nucleus is comparatively small and round and stains deeply in hæmatoxylin.

Karyokinetic figures are not observed. These cells resemble very closely the cortical cells of the adrenal. In some sections the connective-tissue trabeculæ contain orange-colored pigment. Near the kidney the capsule of the growth is composed of kidney tissue. The capsule here is made up principally of connective tissue, but a few glomeruli and compressed tubules are seen in places.

Diagnosis. Hypernephroma of kidney.

He reacted very well from the operation, and on July 2d—the third day—his temperature was only 99° and his pulse 100. An attempt was made to remove the packing, but as it gave him great pain he was given chloroform, and the packing was then readily taken out. There was no hemorrhage, and a small piece of iodoform gauze was put into the wound for drainage. The bowels were opened freely as the result of calomel, and he took peptonized milk with relish. By July 17th the wound was so well closed that he was lifted out of bed into a wheeling chair and taken out on the roof in the cool of the afternoon, and on that day he ate well and slept well and passed 47 ounces of urine.

On August the 14th he was taken to his home in the country in remarkably good physical condition.

By September 6th he had gained very much in strength, in weight, and in color. There was some pain in the region of the wound; there was no swelling, but it was somewhat tender on

pressure, and this only on motion of the body and after he had been sitting up for some time. It was thought that this might be due to a neuritis of the ilioinguinal nerve, which had been damaged during the operation, and particularly as there was an area of numbness over the anterior superior spine of the ilium. Under full doses of iodide of potassium, ice to the side, and quiet in bed for a week the symptoms were very much relieved.

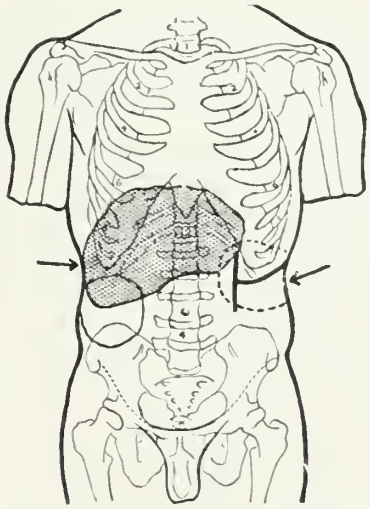
The pain in the back returned, and by October 25th was also on the right side. He had been taking about one grain of morphine hypodermically per day, and it was therefore difficult to say whether his desire for morphine did not exaggerate his pain. His color was not good. He had lost flesh in the last two weeks, but his appetite was fair, while his nights were restless and sleep only obtained by the use of morphine. The urine was highly colored, but the quantity fair in amount. He had had no rise of temperature for a long time, but on October 24th, for the first time, he vomited mucus, which was dark-stained, probably bloody, amounting to about a tablespoonful.

By November 3d he had continued to lose flesh, his color was very poor, and he had almost continuous pain. This pain was in the back and loin and particularly marked on the right side in the region of the remaining kidney. He was so sensitive to manipulation that the slightest touch to the parts produced a muscular spasm, and for this reason it was difficult to make a satisfactory examination. There was, however, a distinct increased area of dulness over the region of the kidney and in the right hypochondrium, with a sense of resistance and probably a mass in that region. From the conditions it was suspected that metastasis had occurred and that there was a growth in this kidney and liver. There was persistent and increasing pain, with progressive loss of flesh, in spite of a very good appetite and every effort to induce an increase in weight. There was diminished knee-jerks, and he complained of numbness in the legs and thighs, and he seemed to be uncertain in his gait.

By December 16th he was much worse. There was swelling and extreme dulness over all the whole right side of the abdomen,

extending almost from the umbilicus to the flank and from the border of the ribs to the iliac fossa. His pain in the past few days had become less, and he had been able to go a whole day without morphine. There had been very marked swelling of the feet and limbs, but this also had subsided within the past few days. Evidently there had been a relief from pressure upon certain of the bloodvessels by change in the size or position of the growth. The bowels were obstinately constipated, so much so that it was difficult for him to have a stool of any sort, even

FIG. 2



(1) area from which the tumor was removed, June 29, 1904, and (2) of dulness December 20, 1905, and (3) enlargement of right kidney.

with high rectal enemeta and active purgatives given by the mouth. This was much more marked than can be accounted for by the hypodermic use of morphine. He was thin, his color very poor, and he complained of a picking sensation all over his body, and the lower limbs were bluish. He was passing a fair quantity of urine, which showed no evidence of blood, although a careful microscopic examination was not made at this time. He was so weak that he was unable to leave his bed, and while his appetite was still fair and he was able to take a good

amount of nourishment, the disease was evidently progressing rapidly.

On December 20th he was seen for the last time. The disease had been making rapid progress. He was greatly emaciated but his tongue was clean and his appetite good. There was marked constipation and the stools were extremely dry. Physical examination showed a fulness and distention of the whole of the right side of the abdomen, extending over to the left of the middle line, even beyond the line of the nipple. There was a large area of dulness and induration, which was undoubtedly a very great enlargement of the liver, particularly of the left lobe. The accompanying diagram shows about the area of dulness. The edges of the liver seemed to have been generally thickened, and it was thought the right kidney was implicated in the growth. The kidney, liver, and stomach, or at least the pyloric end of the stomach, all seemed involved in this new mass, and were probably welled together with adhesions. Shortly after this he had marked swelling of both legs. Certain of the superficial veins of the abdomen were very much dilated, and it showed conclusively that there had been a collateral circulation established to provide against the stoppage of veins internally compressed by this growth. He had at times vomited bloody stained mucus and undigested food, and the nurse stated that when even a hypodermic of morphine was given, and he took about three grains of morphine a day, the prick of the needle bled freely, so freely that she had to make pressure upon the skin for some minutes to stop the bleeding. There was also some fulness in the region of the old wound posteriorly, but the whole of the abdominal scar was in good condition.

He lived until January 19, 1905, suffering pain until his death, just a little over six months from the date of operation and about a year and a half from the appearance of his first symptom.

No postmortem examination was permitted.

I desire to place on record the history of this case of hypernephroma, which is, from a pathological standpoint, typical in its microscopic findings, but which lacks one very important

symptom usually associated with this condition—*i. e.*, hæmaturia. So much has been written on this subject of late by various authors that I shall not go into any elaborate description of the disease, but merely call attention to the chapter on tumors originating in the suprarenal gland by Morris,[1] and to the admirable paper read at the meeting of this college in November last by Drs. Keen, Pfahler, and A. G. Ellis, in which two cases are reported with an analysis of twenty-six reported cases. They give as the three important symptoms—hæmaturia, renal colic, and the detection of a tumor. Why some cases should be intensely malignant with rapid recurrence, involving other organs, both adjacent and remote from direct contact with the original seat of the disease, has not yet been explained by the pathologist, and indeed in the examinations they seem to be unable to distinguish the malignant from the non-malignant cases. Dr. A. O. J. Kelly, in his studies, urges most strongly that the bloodvessels be cut off as soon as possible, and that the manipulation of the tumor be exceedingly gentle during operation, that metastasis may be prevented, and this would seem a wise precaution.

The absence of hæmaturia in this case I report to-night is very strange, as the kidney itself was so deeply involved in the new-growth that one would have supposed this symptom would have played a prominent part.

Albarran found that hæmaturia occurred in 75 per cent. of the cases in his tables, and in Dr. Pfahler's twenty-six cases it was present in nineteen. Dr. James Bell,[2] of Montreal, in a discussion upon a case of hypernephroma presented by Dr. Shepherd, stated that the symptom of hemorrhage means beginning degeneracy or malignancy, and that during the premalignant stage there is not likely to be hemorrhage.

In the one here reported, proven to be intensely malignant, with marked involvement and destruction of the kidney structure, there was never any blood in the urine.

[1] Surgical Diseases of the Kidney and Ureter, vol. ii. p. 15.
[2] Montreal Medical Journal, July, 1905.

DISCUSSION.

Dr. W. T. Longcope: I think the specimens illustrate the condition better than anything I might say. The fact that the tumor was encapsulated, I think, has something to do with the absence of hæmaturia. The central portion of the growth was necrotic.

Dr. A. O. J. Kelly: Apropos of the occurrence or non-occurrence of hæmaturia in hypernephromas of the kidney, to which Dr. Taylor and Dr. Longcope have just referred, it may be worth while repeating what I said last year in discussing Drs. Keen, Pfahler, and Ellis' really noteworthy contribution to the subject—that is, the presence or absence of hæmaturia is due to the anatomical characteristics of the new-growth. In the majority of cases the tumor for a very long time, though growing in the kidney, is extrarenal in the sense that it is separated from the renal parenchyma by a well-defined connective-tissue capsule. There therefore exists no opportunity for blood to get from the tumor into the renal tubules, and hæmaturia does not occur. In not a few cases this anatomical condition persists until death, and hæmaturia is thus missed. In other cases, sooner or later, penetration of the tumor capsule occurs; the new-growth invades the renal parenchyma and forms communications with the renal parenchyma—in which event hæmaturia is a more or less obtrusive clinical manifestation. In some cases, on account of the marked tendency to hemorrhage in these tumors, hæmaturia is a very conspicuous feature. It is most marked when the new-growth has penetrated the mucous membrane of the renal pelvis. Apropos of the malignancy of these tumors, to which Dr. Taylor has also referred, we cannot look upon them otherwise than as quite malignant, although the evidences of this malignancy varies much in different cases. In view of the intimate association of the tumor cells with the bloodvessels, especially the capillaries (to which they are often attached directly), the opportunity for the ready dispersion of the tumor cells through the circulatory stream is ever present, and is by no means infrequent. Some of the metastases that I have seen have occurred in cases in which the original growth was by no means large. A direct growth of the tumor into the renal vein is not uncommon. Metastasis sometimes occurs also by way of the lymphatics.

Dr. W. W. Keen: Two of the cases which I reported a year ago are still living and well, and show no tendency toward recurrence. The third specimen came from a postmortem. Since reporting these three cases I have operated on two others: one a young man in the Orthopædic Hospital when I was assisted by Dr. Taylor. The tumor was very large, and the hemorrhage was so great and the adhesions so extensive that I had to abandon the operation. The patient died a few days later. The second case has not yet been examined microscopically, but is either a sarcoma or

a hypernephroma. The tumor extended far inward toward the median line. When I grasped the pedicle with forceps and removed the tumor I found that I had severed the vein precisely at its junction with the vena cava, the opening being practically a lateral opening into the vena cava. The forceps slipped off, but I was able to arrest the hemorrhage with the thumb and fingers in a moment, and then to substitute a row of hæmostatic forceps for the fingers. I then sutured the opening into the vena cava, removing the forceps seriatim. When the suturing was finished the hemorrhage was entirely controlled. The patient was much exhausted by the disease and the loss of blood, and in spite of infusion of salt solution, etc., succumbed in the course of a few hours. In neither of these later cases, if I remember rightly, was there any hæmaturia, except on one occasion in the last case. That may not have been a renal hemorrhage, but of vesical origin. I have no doubt that a number of the cases I have heretofore diagnosticated as sarcomas have really been hypernephromas.

Dr. William E. Robertson: The difficulty in diagnosis was well exhibited in a case which had been for some time a patient in the Phipps Institute as one of possible tuberculosis. The patient later entered the Episcopal Hospital, and after being there for six or eight weeks died. The symptoms exhibited during his stay in the latter institution were those shown while at the Phipps Institute—viz., anæmia, emaciation, consolidation of right inferior lobe, cough, expectoration, hæmoptysis—but at no time were tubercle bacilli present in the sputum. He died apparently of exhaustion and, I may add, at no time was blood present in the urine. At the necropsy bilateral hypernephromas were found, and instead of transportation being by way of the blood current, as is the rule, it had been altogether lymphatic, and the peribronchial lymph glands had been involved and ruptured into the right bronchus, giving rise to a metastatic condition in the lung. In another case of hypernephroma seen some time ago, and reported to the Pathological Society, and in which the tumor was quite large, there was intermittent hæmoglobinuria and albumosuria.

A NEW METHOD OF OPERATING ON DUPUYTREN'S CONTRACTION OF THE PALMAR FASCIA,

TOGETHER WITH THE SUCCESSFUL USE OF NEURAL INFILTRATION IN SUCH OPERATIONS.[1]

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In *American Medicine* for October 31, 1903, p. 704, appears a brief paper read before this body two years ago, illustrating the successful use of neural infiltration of the median and ulnar nerves during an operation for Dupuytren's contraction of the fingers of the left hand. The patient was a woman, then sixty-two years of age, whose general health was very poor, and who also had a very troublesome chronic bronchitis and a very distinct cardiac murmur, and was exceedingly nervous about her heart and lungs. Hence I used neural infiltration instead of general anæsthesia. The operation that I did for the Dupuytren's contraction on her left hand was the one I have ordinarily done—namely, incision in the line of the pronounced bands and the removal by dissection of the contracting bands in the palmar fascia. October 16, 1905, two years and a half after this operation, I saw her again. The following notes illustrate her condition and the new operation that I was obliged to devise:

For some months past there have been appearing nodules and depressions in the skin of the right palm corresponding to a triangle, with its apex at a point in the middle line of the hand just above a line drawn transversely to the web of the thumb,

[1] Read November 1, 1905.

the base of the triangle being a line drawn between the margins of the forefinger and little finger at the level of the knuckles. (See photograph.) There was evidently beginning contraction of the fascia and there would soon be contraction of all of the

Early stage of Dupuytren's contraction of the palmar fascia. Note the nodules and puckered depressions. The line indicates the flap, which included the palmar fascia.

four fingers to a greater or less extent. The nodules and pits were so diffused over the palm that it seemed to me impossible by incision in the axis where later the bands of contraction would develop satisfactorily to remove the contracting tissue; moreover,

the operation that I had already done upon the left hand, in which I had dissected out these bands, had been followed by a recurrence of the disease, so that the fingers of the left hand were contracted almost as badly as before the first operation.

Accordingly I decided upon operation after a new plan. I first infiltrated the skin just above the wrist over the median and the ulnar nerves with Parke, Davis & Co.'s solution of beta eucaine and adrenalin, of which the following is the formula:

Sol. adrenalin chloride	10 c.c.
Beta eucaine	2 grams.
Sodii chloride	8 grams.
Aquæ destill.	q. s. ad 200 c.c.

Having exposed these two nerves I then injected a few drops of this same solution into the two nerves. After waiting for a considerable time I attempted to begin the operation, but found that it was exceedingly painful. Scarcely any diminution of sensation had been produced by the infiltration, although the injection at the site of the operations on the two nerves had been entirely satisfactory. I then injected into each nerve four or five drops of a 4 per cent. solution of cocaine, and within three minutes was able to begin the operation without the slightest pain. In consequence of a very careful dissection in the palm the operation lasted over half an hour. The local anæsthesia at its end was quite as satisfactory as at the beginning.

Operation, October 19, 1905. I began the incision at the ball of the thumb on a line with the interspace between the forefinger and middle finger, went down almost to the web between the forefinger and middle finger, then transversely to a point just above the web between the ring and little fingers, and up to the ball of the little finger at a point corresponding to the beginning of the incision on the other side of the hand. (See the outline in the photograph.) The dissection of the flap was begun at the transverse incision corresponding to the knuckles and went directly down to the sheaths of the tendons. I dissected back the entire flap, including on the under surface of the flap the entire palmar

fascia. I then dissected away the palmar fascia from the under surface of the flap, the fingers of my assistant being on the palmar surface of the skin, so as to warn me if I got too close to the skin. At one point, in spite of this precaution, a small nick was made entirely through the skin. The whole of the flap, turned back, bled freely, of which I was very glad, as it showed the improbability of any sloughing.

In order to dissect out the fibres going to the index and the little fingers, I next undermined the skin overlying them, and was able readily to get at the beginning small bands of fibrous tissue which had not been turned back in the large flap. I tied half-a-dozen small vessels with catgut, so as to have as little danger from any effused blood as possible.

Union took place by first intention throughout both of the small operation wounds over the nerves and that in the palm of the hand. No sloughing whatever took place; even the little nick that I made inadvertently in the skin of the palm was rather advantageous, as it allowed what little blood was effused under the flap to escape. She was discharged from the hospital with almost normal motion of the fingers, and undoubtedly the use of the hand for a few days would entirely restore its function. She had no rise of temperature whatever after the operation.

Remarks. In this particular case the diffusion of the nodules all over the centre of the palm was such that the ordinary operation for dissecting out the contracting bands would have done no good. I therefore determined to remove the entire palmar fascia. To do this by dissecting up the skin alone would almost certainly have been followed by sloughing of the flap. By lifting a flap consisting of all the tissues of the palm down to the sheath of the tendons I was able to retain sufficient nourishment to the flap to prevent sloughing, and at the same time made the palmar fascia entirely accessible for removal. I was much pleased also to find that I could reach the parts going to the index and little fingers perfectly well by simply undermining the skin. Had it been necessary an incision could have been carried

along the axis of any of the fingers and a more extensive dissection made.

I am inclined to think that this method of operating on the palmar fascia may be desirable in other more advanced cases, where there are distinct bands already formed, and I propose trying it in the next case of this character.

ON AUTOSUGGESTION IN HYSTERIA APROPOS OF A CASE:[1]

WITH REMARKS ON SO-CALLED "HYSTERICAL INSANITIES."

By ALFRED GORDON, M.D.

The study of the innumerable physical and mental manifestations observed in individuals suffering from hysteria can apparently never be exhausted. The character, disposition, emotions, and general mental state of hystericals may undergo so many changes at various periods of their life that the history of each individual case would fill a volume. The problem of hysteria covers a very large field of phenomena. Whatever the manifestations may be they are all dependent upon a special mental state which Gilles de la Tourette had justly called "suggestibility."

Suggestibility cannot be observed in every mind. It requires as essential condition a malady of the personality in which there is lack of synthetic power and a weakening of consciousness. Hysterical subjects have a pre-eminently favorable ground to suggestion, and under certain circumstances they are easily suggested to change their thoughts, to do certain acts, to acquire certain sensations in the general sensorium or in the sphere of the special senses, to execute or to adopt certain motor phenomena. For illustration of the subject, suffice it to mention the experimental mono- or hemiplegias, anæsthesias, paræsthesias, muscular contractions, and even hallucinations, modifications of the whole personality. Complex suggestions containing a large number of associated movements or images are as well characteristic of

[1] Read November 1, 1905.

hysteria. The old magnetizers and the modern hypnotizers understood well the above phenomena and obtained brilliant results from their treatment.

Suggestion is not necessarily a hypnotic phenomenon. It is well established now that it can be induced also in a waking state. In hypnotic as well as in waking states the suggestions have the same characteristic feature—namely, absence of personal perception. The hysterical subject is *not conscious* of the suggested act. He does not understand it; he *does not connect it with his own personality*. It seems that the new suggested ideas develop *automatically* without the controlling power of the will. These *subconscious* acts are particularly evident in so-called autosuggestions. It is astonishing to see to what extraordinary extent subconscious acts of some hysterical persons may develop under the influence of self-suggestion. Through a curious association of images suggested to themselves, through this remarkable tendency to reproduce what they see or hear, thanks to the exquisite sensibility and extreme impressionableness of their psychic centres, they may create sometimes real hallucinations which in their turn may become the point of departure for systematized or unsystematized delusions. In the case I am about to report we will see numerous psychic phenomena of autosuggestion developed under the influence mostly of reading and simulating to a remarkable degree some forms of psychoses, of which the patient was totally unaware, and which developed outside of personal consciousness.

The history of the case is as follows:

M. B., a female aged twenty-four years, consulted me January, 1903, upon the request of her physician, for supposed "epileptic seizures." In spite of the most thorough interrogation of the patient and of her mother it was difficult to determine the true character of her malady. The typical picture of epilepsy was not complete; some of its phases were unfinished and not entirely characteristic, although some symptoms belonged to epilepsy rather than to any other form of convulsive attacks. According to the statements of the family her unconsciousness was complete, and yet she often managed to fall unhurt or to place herself comfortably on a chair. Biting of the tongue was mentioned to me, but I could not trace the slightest injury to

this organ. The sense of exhaustion which usually follows a genuine attack of epilepsy was rarely present in this case. The same could be said about other symptoms. Briefly speaking, it was difficult, if not impossible, to determine the nature of the affection from the history. Soon an opportunity presented itself for me to observe the patient during an attack. I found her on the bed contorting herself—throwing her body forward and sideways, raising one leg at a time, kicking, throwing her fists forward and backward, or making circles in the air; a few seconds later putting the arms back of her head, then pounding on the bed or on her chest very violently, protruding her tongue and inserting the teeth in it so that it bled. She swallowed the blood and apparently experienced pleasure in doing it; then suddenly the trunk assumed the position of opisthotonos. The back of the head and the soles of the feet were the only portions of the body which touched the bed, and she remained suspended in this position fully three or four minutes. It was indeed an acrobatic feat. Then the entire body would become tetanized—arms and legs extended—so that attempts to flex met with the greatest resistance. These tonic spasms were immediately followed by clonic contractions similar to those seen in epilepsy. This ended the attack, which lasted exactly ten minutes. As to the question of loss of consciousness, the latter was not completely lost until the moment of the appearance of the tonic and clonic contractions, when she became entirely unconscious. After regaining her senses she appeared exhausted, helpless, and had to remain in bed for an hour. There was no tendency to sleep.

Questioned whether she remembered any phase of her paroxysm, she could give a clear account of what happened, except the last spasms: "She felt that we were around her; she knew her fists were striking her chest, but she could not control them."

An attack as just described occurred every two or three days under ordinary circumstances, but when the patient would undergo an excitement, a shock of any sort, and especially when a rumor of a funeral would reach her, she would have two or three attacks on the same day. Curiously enough, the sight of a dead body or a notification of death had no effect upon her, but the sight of the procession of a funeral would put her into an extraordinary state of excitement: would cry incessantly, scream at the top of her voice as long as the procession was in the field of her vision, and then suddenly cease when the last trace of the procession disappeared.

On another occasion I saw her in an attack which presented an entirely different picture. I found her then in the middle of the room with the eyes closed, in an attitude of an orator, reciting a pathetic story, which she read on the previous day, gesticulating, raising and lowering her voice, according to the passage of the story, crying when it was necessary and laughing after she was through crying. Here, again, after the narration was ended, she

suddenly dropped, and tonic followed by clonic contractions made their appearance. A state of complete exhaustion was again noticed after she regained consciousness.

During an entire year I saw her several times in these various attacks, but the parents called, then, my attention to a number of paroxysms of an entirely different nature which she had at intervals. Particularly they emphasized the walking and talking and dancing spells. As my visits were not limited, I could observe her repeatedly, and indeed witnessed the most curious phenomena. Once I found her praying, ignoring the presence of people around her. At another time she was seen by me in attacks of semi-consciousness, but talking incessantly and loudly on various subjects which she happened to read or hear, and imitating in all the details the occurrences, or else would argue with some unknown individuals, discussing *pro* and *con*. At another time she would conduct herself as a lawyer in court, and would talk for half an hour defending a criminal. It would require considerable time to describe all the variations of her paroxysms. I may say that they alternated; there was no regularity in their appearance.

The first group of attacks, as described at the beginning, would disappear under the influence of bromides for several weeks, but would be substituted by attacks of delirious nature. When the bromides were taken for a month at a time the above attacks would begin to recur, as if the drug had exhausted its entire effect at the end of a month.

In discussing the nature of the various paroxysms it is evident to me that the majority of them, if not all, are of hysterical type. The only doubt concerns those of the first variety, in which the various hysterical manifestations were followed by a sudden onset of tonic and clonic convulsions with absolute loss of consciousness. They are apparently of epileptic character. It is not at all surprising to find an association of both kinds of paroxysms, but, on the other hand, it is sometimes extremely difficult to differentiate one from another. As to hysteria, it was present here in the most pronounced form. The patient's hysterical stigmata were numerous. The hyperæsthetic areas were multiple, especially marked over the spine and groins. A slight pressure over the skin of left groin would make her scream and complain of pain for two days. There was a total hemianæsthesia on the left side of the body, including face, tongue, pharynx, mucous membrane of the cheek, conjunctiva, and scalp on the same side. Pulling of the hair was absolutely painless on the left side. The visual fields were concentrically contracted. The sense of taste was entirely abolished on the left side of the tongue.

These are the interesting facts of the case as far as the physical symptoms are concerned. But the most remarkable and by far more interesting are the mental features outside of the above-described paroxysms. Once the patient read a fascinating novel, in which the heroine was persecuted by

another woman, who fell in love with her lover. The persecution consisted of plotting, putting poison in the food, and addressing letters of a threatening character, in which uncomplimentary adjectives were attached to the name of the persecuted. Two days after she got through reading the book she became very suspicious of everybody about her. The father and the brother were her enemies. They were sent to annoy her and to do her bodily harm. At night she would lock the door and leave the gas burn in her room; arm herself with knives and pokers, and on the slightest noise would jump off the bed, ready to fight. She would not allow her mother to prepare her meals, fearing to be poisoned, and cooked for herself the three meals. She looked suspiciously at every visitor. The condition lasted two days, when the delusions of persecution became gradually milder, and finally disappeared. This condition was followed by a period of depression, during which she refused food, could not sleep, and did not speak. She would spend hours in the corner of the room muttering some unintelligible words. At times tears could be seen in her eyes or she would sigh. She presented, therefore, the picture of typical melancholia without delusions.

At the end of three days suddenly the patient recovered, and when told of her last condition a paroxysm of intense excitement, followed by convulsions, occurred. Two months later she came to my office and showed me a wedding ring on her finger. Voluntarily she told me that she got married. She described in detail the marriage ceremony, the wedding trip abroad, and the places she visited. The description was one of the most picturesque and poetical one could possibly imagine. During the recital she could not remain in the chair; was all full of ecstasy and enthusiasm and could not be stopped, lest she would become indignant. On the following day I learned that no marriage ceremony occurred and no trip abroad was taken. Her mother told me that during two days she did nothing but read a novel, and was so much absorbed with her reading that she did not care to eat or sleep. The novel treated of a love story, which ended with a beautiful marriage ceremony and a trip abroad. On another occasion she read a book which described the elopement of a young girl from her parents' home, and told how the girl went on the stage and made a great success. The autosuggestion was so great that after an interval of three weeks, during which I could not see her, she told me of her adventures on the stage: "She was such an excellent singer and actress that managers were after her; she made only one tour in the State, but is already tired and came home to rest." Investigation showed it to be false.

It would take considerable time and space to describe all the varieties of autosuggestion that the young woman underwent. I will only mention one, as it is of unusual interest and of rare occurrence. Upon one occasion she visited a friend who was married and had a beautiful little girl, of whom

everyone was fond. After she returned home she had one of her usual hysterical attacks. This was followed by a state of childishness, or mental puerilism. While being able to be about she began to talk and conduct herself like a child of three or four years of age. She begged her mother to get a doll for her, and when this was refused she cried bitterly. The mother had to yield. She then spent her time in dressing and washing the doll, talking to it in childish language. This curious condition lasted six hours, after which, suddenly and with a deep sigh, she appeared to regain her self-consciousness. She could not give an account of what occurred.

I shall not go into further description of various curious occurrences in the life of my patient. Although they vary in details, they are nevertheless all of the same nature. The underlying basis was the hysterical autosuggestions. The paranoia-like and melancholia-like attacks which she presented at various times, even the puerilism, all presented the same hysterical character, and were brought on by autosuggestion.

The case is of great interest from several standpoints: (1) The association of hysteria and epilepsy; (2) the mental phenomena; (3) the development of the mental manifestations under the exclusive influence of autosuggestion. The mental symptoms deserve special mention. We observed here various symptoms which are habitually found in genuine alienation—delirium, delusions, hallucinations. We observed here the picture of some genuine psychosis—melancholia-like and paranoia-like forms. As to the delirium, its character, its alternation with hysterical paroxysms, and particularly its duration, are all features which are not found in the delirium as a classical psychosis. The examples of paranoiac delusions of persecution and melancholic attack which our patient presented—are they genuine forms of mental alienation? Esquirol said that hysteria often turns into insanity, of which it is in many cases the first degree. But at that period hysteria was vaguely understood.

Morel insists upon the relationship of hysterical insanity to hereditary predisposition to psychoses.

Moreau de Tours, although he confounds the psychic manifestations of hysteria with mental alienation, nevertheless realizes that the so-called hysterical insanity is in reality a simple delirium.

Legrand du Saulle[1] considers four degrees of mental disturbances in hysteria and only the latter, which consists of attacks of depression or excitement with or without hallucinations, with or without irresistible acts, constitutes "hysterical insanity."

Krafft-Ebing[2] speaks of hysterical psychoses and divides them into those with a favorable prognosis (melancholia, mania) and forms of so-called "moral insanity." All these divisions and subdivisions are extremely vague. They do not correspond to the true clinical pictures which we observe in practice. If hysterical symptoms are occasionally observed in cases of insanity they are only associated phenomena. Hysteria *per se* may be considered as a degenerative stigma, and it is therefore not surprising at all to find it associated with various forms of mental alienation. If they are both present in the same individual, either will preserve its special features, but not influence each other. Hysteria may simulate as well as accompany various mental affections. The old conception of hysterical insanities as morbid entities does not hold its ground as clinical entities. Attacks of delirium, of depression or excitement, and even periods of apparent mental derangement with distinct delusions and hallucinations, are only episodes in the life of hysterical individuals. They are *equivalents* of ordinary hysterical paroxysms, just as psychic phenomena sometimes take place of ordinary epileptic seizures. Hysterical paranoia, hysterical melancholia, and hysterical mania are not in existence, as they have no logical basis. A careful reading of histories of cases reported as forms of hysterical insanities show conclusively that the course, character, duration, and consequences of the psychic symptoms are not at all those of the typical psychoses, that they all are a sort of transformation of ordinary hysterical paroxysms, that they all are the result of an autosuggestion.

These few considerations on the so-called "hysterical insanities" find a good illustration in the history of the remarkable case which I had the honor to present to you to-night.

[1] Les hystériques, Paris, 1883.
[2] Lehrbuch der Psychiatrie, 1888.

DISCUSSION.

Dr. F. X. Dercum: Dr. Gordon has said that hysteria offers a never-ending field of study because it presents itself in such manifold forms. With this I heartily agree. At the same time it is impossible to properly classify the symptoms which hysterical patients present, and especially is this true of the mental phenomena. Thus we have first the mental symptoms of the hysterical attack, which are clearly those of a delirium; secondly, that more prolonged state of less active disturbance, which the French call hystero-somnambulism and the Germans term the Dämmerzustand—a state which is clearly one of confusion, more or less prolonged; thirdly, we have hysterical stupor, sleep, or coma, as it is variously termed. Hysterical delirium is the most common mental disturbance observed, and is a very frequent accompaniment of the hysterical paroxysm. In its essentials this delirium does not differ from that due to other causes. There are here as elsewhere the evidences of auditory, visual, and other hallucinations, active confusion, unsystematized and fragmentary delusions and excitement. Hysterical confusion—that is, the Dämmerzustand or hystero-somnambulism—is a more prolonged mental disturbance, embracing the same elements as the delirium, but attended by far less activity and excitement. It is beyond all question the most interesting form of hysterical mental aberration, and it is with this form of mental disturbance that Dr. Gordon's case must be classed. The symptoms are frequently those of a simple confusion. The patient is unable to accurately appreciate her relation to the environment; the memory is perverted by fictitious experiences or by an admixture of fictitious and real experiences. There is as a consequence an apparent invention or fabrication of past occurrences and present relations. That hallucinations, and especially illusions, play an important role in the production of the confused state there can be no doubt. The most importance must probably be ascribed to the illusions. Indeed, some writers, like Hellpach, regard the essential characteristic of hysteria as a disease of apperception. With this limited interpretation of the mental phenomena of hysteria I do not at all agree; still, the importance of the role played by the illusions must be fully recognized. In order to explain the detailed phenomena presented by any one case, we must bear in mind the one well-known clinical factor of hysteria, and that is the exaggerated state of suggestibility which is present. Furthermore, we should in addition remember that the hysterical patient is not only open to the suggestions which are derived from the external world—that is, from her daily experiences, from the work that she does, from the persons with whom she comes in contact, from the books which she reads—but also from the various mental impressions received from the viscera. The visceral impres-

sions are in the normal state, as is well known, relegated to the field of subconsciousness, and yet as soon as modifications of these impressions arise the field of consciousness is penetrated, and they at once occupy a share of our thoughts. That decided changes in peripheral impressions frequently occur in the hysterical subject is well known, as witness the various forms of hysterical anæsthesia—hysterical, painful tenderness, contraction and reversal of the color fields, and like phenomena. It is probable that the visceral sensations are subject to like changes. With so manifold sources of illusional disturbances it is not surprising that the patient, in hysterical confusion—that is, the Dämmerzustand, or hystero-somnambulism—may simulate more or less other mental affections. If the readings of the patient, as in the instance of Dr. Gordon's case, coupled with visceral illusions—in this instance possibly sexual illusions—bring about a train of thought more or less systematized, we have a paranoia simulated; if, on the other hand, the sum total of the multiple impressions experienced by the patient lead to mental depression and ideas of self-accusation, we have the simulation of a case of melancholia. Finally, should the patient, as a result of perverted visceral impressions, have her attention directed to her body, her mental attitude will be similar to that seen in hypochondria, as witness the cases in which the patient constantly desires medical attendance or is constantly craving examinations, surgical operations, and like procedures.

Ordinarily cases of hysterical confusion are comparatively limited in their duration—a few hours or a few days. However, if they be at all prolonged they give rise to the cases so frequently discussed in the literature as double or multiple personality. Dr. Gordon's case, for instance, presents such elements, and I venture to predict that his patient, with recurrent attacks, may eventually pass into one of typical multiple personality. A final word should, I think, be said with regard to the relation of hysterical confusion and hypnosis. Personally I believe the states to be identical. The phenomena of hysterical confusion—hysterical somnambulism, Dämmerzustand—are indistinguishable in their essentials from the phenomena of hypnotic somnambulism; indeed, hypnosis must be regarded as merely an artificially induced hysterical somnambulism, and this thought leads to one important and practical inference, namely, the absurdity of the treatment of hysterical confusion by hypnotism.

Dr. Robert H. Chase: An interesting phase of Dr. Gordon's paper may be found in the many sided relations that suggestion and autosuggestion bear to both normal and abnormal mental life. Nowhere is the expression of this psychic phenomena so conspicuous as in hysterical subjects. The term suggestion is used by writers in a broad as well as in a narrow sense, and in this way wide variation exists among them, which has served to render the subject obscure. There is no doubt that man is a very suggestible animal.

Beginning back in childhood, owing to the nature of the child's mind his acts are due very largely to suggestion. Imitation is the chief motive factor in the child. At this age, before the higher aptitudes have been developed, imitation is only another name for suggestion. The little ones at play follow the older, not as the result of reason and judgment, but simply as a matter of pure suggestion. Many instances of suggestion in the normal man may readily occur to you. You know how easy it is to cause one to feel badly, and even to put one ill in bed, by the concerted action of friends suggesting how sick one looks. Then there is the college hazing incident in which a young man had been put into a darkened room, and from the dropping of water into a bucket he thought he was bleeding to death, and really came near losing his life through the suggestion. Preperception, as in expectation and suspicion, is also a form of normal suggestion. Recently a friend told me of an occurrence happening to him which illustrates a form of suggestion, and which is often erroneously defined as telepathy. He had a very sick uncle in whom he was deeply interested, and one night went out to visit him. It was getting late as he went down the street, and as he approached the house he noticed that the lights were out and concluded not to go in. He went back home and to bed. At about 4 o'clock he heard this uncle calling to him in a familiar tone and by a familiar nickname. It was so real to him that he got up and was certain that someone had called him. He asked the nurse who was in attendance upon his wife if she had heard anyone calling; but she had not, and about breakfast time word came that the uncle had died at the early morning. Again, there is a tradition in my family, coming down from my grandmother's time, that she had had on a certain occasion a mysterious vision. My grandmother, who lived in New Bedford, Mass., was awakened early one morning by seeing the vision of an angel floating over the foot of her bed. At this time one of her daughters, who lived in Flushing, N. Y., had been very ill. On the morning of the vision a telegram was received that her daughter had died. Commonly, these perception phantasms would be considered examples of telepathy, while, in fact, they are instances of autosuggestion, arising in each case, respectively, from an auditory and visual hallucination of the hypnogogic type.

Just now we have a convalescent patient who excites unusual interest because she is able and willing to give an intelligent account of her state of mind during her illness. The case was one of confusional insanity, in which there seemed to be a weakening of the synthetic power of the mind, so that there was a division between her normal and abnormal states of consciousness. In her illness her life seemed so strange that she felt that she was in another world. To be sure, she remembered about her former life and thought of her friends as still being in that life, but she herself seemed separated from it as by an impassable gulf. In her morbid life she was

completely dominated by autosuggestion in the form of auditory hallucinations. She felt obliged to obey the commands of these voices. In convalescence she gradually came to understand the nature of the voices, and little by little gained power to suppress them. While she still heard ringing in her ears the articulate sounds had disappeared.

It seems to me that suggestive therapeutics (by which I do not mean hypnotism) will occupy a much larger place as time goes on, and that in ten or fifteen years it will be practised very much more than it is to-day. You remember that electricity was in the hands of quacks in former times, but is now becoming more and more appreciated by the medical profession. I believe that suggestive therapeutics will eventually be regarded as a very important form of treatment for the nervous and the insane.

THE TREATMENT OF SELECTED CASES OF CEREBRAL, SPINAL, AND PERIPHERAL NERVE PALSIES AND ATHETOSIS BY NERVE TRANSPLANTATION.

WITH THE REPORT OF A CASE OF ATHETOSIS BENEFITED BY OPERATION.[1]

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REMARKS BY DR. SPILLER.

A new field seems to have been opened in the treatment of selected cases of paralysis, whether they are of cerebral, spinal, or peripheral nerve origin, and also in the treatment of athetosis. It is not too much to say that the results obtained in cases of acute anterior poliomyelitis by nerve transplantation have been so encouraging that the operation for the recovery from the paralysis in selected cases of this disorder may now be regarded as passing beyond the experimental stage.

Acute anterior poliomyelitis is a disease of a more or less limited number of nerve cells in the anterior horn or horns of the spinal cord. In 1902 it occurred to me that we should be able by nerve transplantation in acute anterior poliomyelitis to

[1] Read November 1, 1905.

bring diseased peripheral nerve fibres into union with healthy nerves, and thereby to restore function. Such a procedure would be more advantageous than a tendon transplantation, as by the former method the paralyzed muscles would be restored if the operation were successful. The subject has been discussed in a paper by Dr. Frazier and myself,[1] read before the American Medical Association.

In 1902 I suggested to Dr. C. H. Frazier and Dr. J. K. Young that we might with propriety try nerve transplantation in cases of acute anterior poliomyelitis where the palsy is not very extensive. The operation was performed on December 4, 1902, by Dr. Young, and the patient was exhibited by Dr. Young and myself before the Philadelphia Neurological Society February 24, 1903, and the case was reported in the *Journal of Nervous and Mental Disease,* in the proceedings of the Society, June, 1903. Even in February, 1903, some return of power could be observed, and at the present time the improvement is distinct. The case has been reported by Dr. Young before the American Orthopedic Association June, 1904, and also in a paper by Dr. Frazier and myself,[2] together with the report of another case in which the operation had been done by Dr. Frazier almost at the same time.

The chief dangers in operating on cases of anterior poliomyelitis are delayed union and overgrowth of connective tissue in the nerve at the site of operation. Where a whole nerve is diseased and is so large as the peroneal, it is probably necessary to cut a portion of the sound nerve used for grafting, either transversely or transversely and longitudinally, and when the latter is done to insert the split portion into the diseased nerve; but where the fibres are small, as are those supplying the anterior tibial muscle, probably a sufficient number of nerve fibres are cut in the healthy nerve by the longitudinal splitting and the insertion of the diseased fibres within the slit. The new axis cylinders which develop after an injury of nerve fibres are more numerous

[1] Journal of the American Medical Association, January 21, 1905.
[2] Loc cit.

than those existing before the operation, and, probably by growing into the diseased nerve, if we accept this view of regeneration, suffice for its innervation. If we accept the peripheral theory of regeneration, the axis cylinders that develop in the peripheral end of the nerve are sufficient for the restoration of function. It hardly seems advisable to cut a healthy nerve entirely across, as Kilvington suggests, because if an excessive amount of connective tissue forms, reunion with functional restoration of the formerly healthy fibres may not occur.

Peckham,[1] as I found later, cut two of the four branches passing from the internal popliteal nerve into the heads of the gastrocnemius in a case of anterior poliomyelitis of ten years' duration, and inserted them into the diseased nerve. At the end of six weeks the toes could be extended (dorsal flexion) until they were perfectly straight, a motion that had been impossible until after this operation. There was no apparent weakness in the gastrocnemius and soleus muscles. The same operation was performed in another case for paralysis, resulting from fracture of the spine. The results were not very gratifying in either case, and his paper seems to have received little or no attention.

The paralysis in cases of acute anterior poliomyelitis is often confined to a small group of muscles, as shown in a recent paper by Walther Baumann.[2] Baumann examined 85 cases of acute anterior poliomyelitis. Complete paralysis of one or both lower limbs occurred in 16 cases; complete paralysis of the lower limbs, except that the movement of the toes was preserved, in 5 cases; complete paralysis of the lower limbs, except that the movements of the extensor digitorum communis and the peronei were preserved, in 1 case.

Paralysis of only the dorsal flexors of the foot occurred in	.	.	.	29 cases.
" " the extensors of the knee "	.	.	.	12 "
" " peronei "	.	.	.	10 "
" " calf muscles "	.	.	.	8 "
" " flexors of the knee "	.	.	.	8 "
" " tibialis anticus "	.	.	.	7 "
" " glutei "	.	.	.	6 "
" " adductors "	.	.	.	2 "

[1] Providence Medical Journal, January, 1900, p. 5.

[2] Monatsschrift f. Psychiatrie und Neurologie, June, 1905, p. 485.

Complete paralysis of one or both upper limbs occurred in 3 cases; complete paralysis, except that the movements of the fingers were preserved, in 2 cases.

Paralysis of only the deltoideus	occurred in	8	cases.
" " flexors of the forearm	"	5	"
" " thenar eminence	"	5	"
" " pectoralis major and supinator longus	"	3	"
" " triceps	"	4	"
" " small muscles of the hand	"	2	"
" " supraspinatus	"	2	"
" " entire musculospiral territory	"	1	"

From this table it will readily be seen that partial paralysis is very common in anterior poliomyelitis, and especially noteworthy is the large number of cases, 29, in which the dorsal flexors of the foot were paralyzed. It is probably because of this that attention has been directed chiefly to the lower limbs as regards nerve transplantation in acute anterior poliomyelitis. The paralysis of the upper limbs, however, is amenable to treatment by nerve transplantation.

Hackenbruch[1] reported at the meeting of the Kongress der Deutschen Gesellschaft für Chirurgie, June, 1903, and therefore after the presentation of the case by Dr. Young and myself in February, 1903, that he had inserted a third of the tibial nerve into the paralyzed peroneal nerve in a case of poliomyelitis. In June, 1905, he reported the results obtained in this case and in two others. Two cases were only partially successful, but the third gave most gratifying results.

This third case was one of peroneal palsy, and the palsy seems to have been complete in the distribution of the peroneal nerve. A third of the posterior tibial nerve was inserted into the peroneal. Slight improvement was seen four months after the operation, but a year and a half after the operation the movements of the lower limb and foot were good; the patient was able to elevate herself upon the toes of this foot, and to stand on this foot alone. The limb had become 1 cm. longer and the foot had

[1] Archiv f. klin. Chirurgie, 1903, No. 3, Bd. lxxi. p. 638; also, Deutsche med. Wochenschrift, June 22, 1905, No. 25, p. 986.

become larger. The limb, as a whole, was a little weaker than the other.

Many experiments have been performed in nerve transplantation on living animals since the first operation by Flourens. Basil Kilvington[1] gives a very good presentation of this subject, and then makes an application to surgery. He suggests that nerve transplantation might be used in cases of anterior poliomyelitis, although he acknowledges that he has not performed the operation on the human subject. As he makes no reference to the work of others, in so far as it relates to man, he was probably ignorant of the results already accomplished in cases of anterior poliomyelitis. His suggestion is to suture the nerve supplying the paralyzed muscles on to the cut surface of the proximal end of an adjacent healthy nerve. The healthy nerve may be cut partly across and the paralyzed nerve fixed in the gap so formed, or the healthy nerve may be cut completely across and its own peripheral end, as well as the peripheral end of the paralyzed nerve, may be sutured to the central end. This hardly seems a wise proceeding to me. Kilvington published his paper April 29, 1905.

Harris[2] and Low reported before the Clinical Society of London October, 1904, a case of infantile paralysis, in which they had done nerve suture in order to overcome paralysis of the right deltoid and spinati muscles. The operation is described by Harris in an abstract as follows (the original paper I have not as yet been able to obtain): The fifth cervical nerve was split in halves, and the upper bundle, which caused no muscular contraction on faradic stimulation, save fibrillary movements in the deltoid, was cut across as near the foramen as possible and turned down in front of the remaining half of the fifth nerve, and then sutured into a nick cut in the front of the sixth cervical nerve. The uncut portion of the fifth nerve contained the fibres for the biceps, as faradic stimulation of this bundle caused powerful flexion of the forearm. In this way the degenerated bundle

[1] British Medical Journal, April 29, 1905, p. 935.
[2] Practitioner, August, 1905, p. 228.

in the fifth nerve supplying the deltoid was sutured on to a healthy nerve, so as to allow regeneration to take place by the formation of a connection with the healthy fibres in the sixth nerve. For six months after the operation no sign of improvement appeared, in spite of regular massage and galvanism; then eleven

FIG. 1

Photograph taken before the first operation, indistinct despite the fact that it was instantaneous. It shows how constant and uncontrollable were the athetoid movements and shows also the intensity of the spasms. Much of the blurring of outlines has been removed in the reproduction.

months after the onset of the paralysis slight improvement in the power of the shoulder was noticed, and the progress, at first slow, afterward more rapid, was maintained, so that ultimately the child could put up her arm readily straight above her head.

It is therefore true, I think, that the operation of nerve transplantation for acute anterior poliomyelitis, where the paralysis is

not too extensive, is passing beyond the experimental stage. The application of nerve transplantation to peripheral nerve palsies is apparent.

In most cases of hemiplegia the paralysis is greater in the extensors of the upper limb and in the flexors of the lower limb, but, as a rule, the difference is not sufficiently marked to justify

FIG. 2

Instantaneous photograph taken before the first operation, showing the violence of the spasms.

the operation of nerve transplantation. Occasionally, however, the palsy is much more intense in certain muscles. Fischer,[1] recently, in speaking of this subject, states that the weakness of the extensors of the fingers in rare cases of cerebral lesion may be so pronounced that the paralysis may have the appearance of musculospiral palsy, as in the cases of Pick and Oppenheim. I have observed a distinct difference in the degree of paralysis in

[1] Monatsschrift f. Psychiatrie und Neurologie, August, 1905, p. 98.

the extensor and flexor groups of muscles in a number of cases in which hemiplegia had developed early in life.

It has been my endeavor for several years to devise some method of treatment for athetosis. This condition is observed only when some return of function has occurred, or, at least, when the paralysis is incomplete, and if the movements are violent the muscles hypertrophy because of their constant use. The patient with severe athetosis, however, has little or no voluntary control of his limbs, and the flexors are usually much more powerful than the extensors in the upper limbs. It occurred to me that if we could switch off, so to speak, some of this excessive innervation of the flexors into the extensors by nerve transplantation, we might be able to establish a more nearly normal relation between certain groups of muscles and their opponents, and by division of nerves be able to lessen the athetoid movements probably permanently. It hardly seemed likely that the restoration of function would be so perfect as to permit a return of athetoid spasms. This subject was presented by Dr. Frazier and myself[1] in a paper read before the New York Neurological Society March 7, 1905. At that meeting Dr. G. L. Walton remarked that in a case coming under his observation the athetosis was so troublesome that the arm was amputated at the shoulder at the request of the patient.

A case of extremely violent athetosis has been under my care about five or six years at irregular periods. The young man had probably had the movements all his life, except possibly during his first year, and had no control over his powerful muscles. His mother had been obliged for years to dress him with the greatest difficulty every morning. His upper limbs were jerked about most violently, but the flexor muscles were far more powerful than the extensors. The case seemed most suitable for an attempt at nerve transplantation, and was referred to me by Dr. Frazier for this purpose. The method of operation will be described by Dr. Frazier. The case was presented at the meeting

[1] Journal of Nervous and Mental Disease, May, 1905, p. 310; Walton, ibid., October, 1905, p. 655.

of the American Neurological Association June 2, 1905, two months and a half after the first operation, and at that time there was distinct return of power at the wrist, in the flexors of the fingers, and at the elbow, but the movements were by no means normal. The presentation was made at that time in order that

FIG. 3

Photograph taken soon after the first operation, showing the immediate paralysis of the left upper limb and marked athetoid movements of the right.

the many neurologists present might be able to judge for themselves of the degree of athetosis that had existed before the operation, inasmuch as the right upper limb had not been operated upon at the time of the presentation, and in order that the developments of the case, whatever they might be, could be watched. We made no claims, nor do we now, but presented

the results of a hitherto unattempted operation for the relief of a most distressing condition, believing that, whether failure or success were the ultimate outcome, the results should be made known.

As early as two and a half months after the operation the condition of the patient was so much improved that he was well satisfied with the results, and stated he had never in his life

FIG. 4

Photograph taken July 14, 1905, 120 days after the first operation, showing flexion of the forearm on arm as an evidence of gradual restoration of voluntary movements.

been in so comfortable a condition. We had established at that time that it was possible to remove the athetosis if we caused a partial paralysis, and we could argue that should the athetosis return it would do so only with the disappearance of the paralysis. In case of return of athetosis we should be able to diminish the voluntary power, and thereby also the athetosis, by some other operation.

It may be said that the operation was an attempt to influence a cerebral lesion by disturbing peripheral nerves, and this, indeed, is what it was. We could not remove the source of the irritation, but, if we could remove the manifestations of this irritation without causing the patient more discomfort, we might consider the operation a success. This is what we have accomplished. There is no doubt that this man's condition is far better than it was before any operation was attempted, and we may hope for

FIG. 5

Photograph taken July 14, 1905, 120 days after the first operation, showing flexion of the hand on the forearm as an evidence of return of voluntary movements.

still greater restoration of power. He has now returned to his occupation of selling papers, and is very happy over his improved condition.

Massage and electricity have done much to keep up the tone of the muscles, and the patient has made frequent attempts to employ his upper limbs. He is now being treated by systematic gymnastic exercises.

Seven and a half months have passed since the first operation and the results are most encouraging, and lead us to believe that

athetosis will not return, or if it should that it will be far less severe than before the first operation. It is important to have established that with partial paralysis, produced by operation on nerves, athetosis disappears. No one, I think, who was familiar with this man's condition before any operation was performed, and sees him now, would dispute that he is far more comfortable than at any period of his life.

If athetosis is the result of irritation of central motor fibres it seems strange that no symptoms are produced by the prevention of any manifestation of this irritation. One might suppose that the impulses sent over the motor tracts, having been arrested, would flow over into fibres destined for the innervation of the lower limbs, or that some evidence of discomfort would be observed. Nothing of the kind occurred. It is said that sometimes in epilepsy, when the convulsion is arrested, the patient's condition is worse than if the convulsive seizure had freed the stored-up energy, and we might expect a somewhat similar result when the irritation of athetosis finds no outward expression, but such does not seem to be the case.

Dr. Purves Stewart recently suggested to me, after seeing the patient, that if in epilepsy we could cut all the motor nerves we should arrest the convulsions and produce a condition similar to that seen in our patient, so far as arrest of involuntary movements is concerned, but we should not cure the epilepsy. I fully agree with him in this statement, but if we have arrested the athetoid movements, even though we have not removed the cerebral lesion, we have accomplished much. Epilepsy is more than convulsions, but if it were a practical operation to cut the nerves for the prevention of spasm, which of course it is not, we might resort to it.

The operation performed in this case of athetosis shows convincingly that when the peripheral end of a healthy nerve is inserted into another healthy nerve by a longitudinal and not transverse incision in the latter, return of function may occur in the inserted nerve. The musculospiral nerve was not cut transversely, and yet partial return of function has occurred in the

distributions of the median and ulnar nerves. The results justify the end-to-side anastomosis—the peripheral end of the affected nerve inserted into the unaffected nerve—we have advised for the treatment of the paralysis of anterior poliomyelitis confined to one or two muscles. There is unquestionably a difference between using the peripheral end of a healthy nerve and the peripheral end of a diseased nerve, but if the nerve is much

FIG. 6

Photograph taken July 14, 1905, 120 days after the first operation, showing the partial flexion of fingers as evidence of gradual restoration of voluntary movements.

affected it is not likely to regenerate by any method of transplantation, and it is because of this that the prognosis is better the earlier the operation is done. This method of end-to-side anastomosis, however, would probably not be advisable in those cases in which the entire nerve distribution—such as the peroneal—was affected, and it would probably be necessary, under such circumstances, to insert some healthy fibres into the diseased nerve.

The experimental operations noted below were performed at the suggestion of Drs. Spiller and Frazier under the direction of Dr. Van Kaathoven. The two cases cited are chosen as representative of a series of similar experiments giving similar results. This experimental work was done partly to demonstrate certain questions regarding restoration of function and the operative technique, and was performed in connection with the voluntary course in operative surgery.

FIG. 7

Photograph taken in December, 1905, showing the voluntary power in raising the left upper limb at the shoulder and in flexing the left forearm on the arm.

CASE I.—Mongrel dog. Operation. An incision was made on the anterior aspect of the thigh over the femoral vessels, and the anterior crural nerve exposed and freed. A posterior incision half-way between the great trochanter and tuberosity of the ischium was then made, the muscles separated, and the sciatic nerve exposed and freed. An opening was then made through the adductor magnus, this perforation allowing of communication between the anterior and posterior aspects of the thigh. The two nerves were then cut. By means of silk sutures through the sheath the peripheral portion of the anterior crural was sutured to the proximal part of the sciatic, and the peripheral sciatic to the proximal anterior crural. The leg was then partially immobilized, the superficial wounds having been closed by means of silkworm sutures. Result: six days after operation the wounds were examined and found to have

united by first intention. Stitches and bandage were removed. During the middle of the second week the dog commenced to move the injured leg. At the beginning of the third week restoration of function became more marked. It was observed that when walking the animal extended its hind leg instead of flexing it. After three or four unsuccessful attempts at walking on the injured foot the animal apparently became discouraged and let the leg hang down, scampering away on three legs. About the onset of the fourth week the dog had apparently learned to control the movements of the hind leg, although when running he still frequently extended the leg instead of flexing it. During the latter part of the week the animal had improved markedly in its locomotion, the only defect being a turning under of the foot, apparently due to inability to extend it freely. At the end of the fifth week he showed marked improvement in this condition, now only turning the foot under occasionally, apparently only when running or excited. During the sixth and seventh weeks the animal practically walked as well as before section of the nerves. The results of this experiment were exactly similar to those of earlier ones, the same operation having been performed.

Case II.—Terrier. A similar operation was performed upon the brachial plexus, the nerves being reached by a transverse section of the pectoralis major and a separation of the fibres of the pectoralis minor. The median and musculospiral nerves were chosen for the experiment. Suturing was done as before—peripheral median to proximal musculospiral and proximal median to peripheral musculospiral. Aside from some superficial suppuration the dog made a good operative recovery. No restoration of function followed operation for eight weeks. There was some contracture at the elbow-joint, none at the wrist. After fourteen to sixteen weeks there was less contracture and less atrophy, still the dog seemed to make little or no use of its leg. The explanation of failure in the case of experimentation on the brachial plexus lies probably in the fact that the undivided nerves, the ulnar and musculocutaneous, cause spasm of the muscle groups governed by them, as the groups innervated by the median and musculospiral are temporarily paralyzed.

HISTORY OF CASE OF ATHETOSIS.

Frederick H., aged nineteen years, was admitted to the University Hospital on March 10, 1905.

Social History. Single, native of Philadelphia. More than an average consumer of tea and coffee. Occupation, sells newspapers.

Previous Medical History. He was said to have been born at the seventh month. Had pertussis in childhood. For the past year has complained of rheumatic pains in the right leg, which have gradually grown worse. Apart from this he has always enjoyed good health.

FIG. 8

Photograph taken in December, 1905, showing the voluntary power in flexion of the fingers of the left hand.

FIG. 9

Photograph taken in December, 1905, showing extension of the fingers of the left hand. Extension is greater when more effort is made, as shown in Fig. 10.

Family History. Father and mother both complain of rheumatism; the former is believed to have some disease of the kidneys. Three brothers and sisters are living and in good health. There is no tuberculous, cardiac, neoplastic, or neurotic history in the ancestry.

History of Present Condition. The patient says that when he was eight months old he fell from a hammock, alighting on his back, and that he was unconscious for two hours. Nothing, however, abnormal was noticed about the patient until he was two years old, when he was taken to the Jefferson Hospital because of the beginning athetoid movements of his hands and arms, and also because of his inability to walk. His mother was told that nothing could be done, and that his condition was not the result of the accident. From the ages between two and twelve his movements became more exaggerated, and there seemed to be some disturbance in speech. He did not learn to walk

FIG. 10

Photograph taken in December, 1905, showing still more extension of the fingers of the left hand than is shown in Fig. 9. The index and middle fingers are doubled, as they were not held quietly while the photograph was taken.

until he was twelve years of age. He then slowly improved in gait until the present time. Owing to weakness in his ankles and knees and the athetoid movements of his upper extremities he frequently fell down. He had been under the care of Dr. Spiller for several years at the Polyclinic and University Hospitals, and later during a part of his stay at the Philadelphia General Hospital.

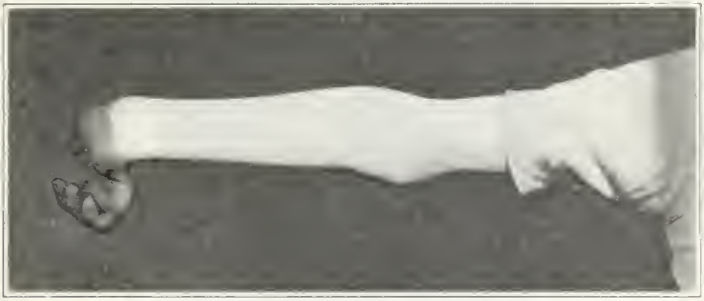
While in the surgical wards of the Philadelphia General Hospital a craniotomy was performed, and the cortical centre for his left upper extremity was excised. During his convalescence from this operation he had two or three convulsions, in which he lost consciousness at times for ten minutes. Since the operation his left arm has been more rigid, the pain in his right arm has been more pronounced, and his condition has grown steadily worse. The athetoid movements are very much more marked during excitement and cease entirely during sleep.

Physical Examination. Urine analysis: acid reaction; specific gravity, 1032; no albumin; no sugar; small amount of mucoid precipitate. Microscopic examination negative.

Athetoid movements are not observed in the face, and the cranial nerves are not affected.

The upper limbs are in constant violent spasm, and present intense athetoid movements in all parts. The flexor spasms predominate over the extensor spasms, and the hands are flexed forcibly on the forearms, and the forearms on the arms. From time to time either limb is drawn upward and backward at the shoulder, and sometimes the entire limb is drawn behind the trunk and held in this position a minute or two. In removing the coat of the patient great difficulty is experienced because of the violent spasms. The muscles of the upper limbs are unusually well developed as a result of the spastic movements, and yet the patient has not the slightest control over the upper limbs. Any

FIG. 11



Photograph taken in December, 1905, showing the ability to raise the right upper limb. The operation on this limb was performed June 13, 1905.

attempt on his part to perform a voluntary movement with his upper limbs increases the athetosis in an extreme degree.

The lower limbs are somewhat spastic, but not sufficiently so to prevent walking. His gait is awkward and stiff because of the marked tonicity of the muscles, but athetoid movements are not observed in these limbs.

March 16, 1905. First operation on the left extremity—lateral anastomosis of the divided median and ulnar nerves to the musculospiral nerve, as depicted in Fig. 14.

17*th*. Patient complains of pain, the result of involuntary contraction of triceps and coracobrachialis. The patient can extend the fingers and the hand on the wrist.

18*th*. Wound dressed and rubber-tissue drain removed. Plaster-of-Paris dressing reapplied. Convulsive movements of the left arm are not so pronounced as before the operation. There is no evidence of restoration of sensation in the distribution of the median nerve.

21*st*. Patient rests quietly the greater part of the time, and is kept in bed because that position is conducive to quietude. The wound is running an aseptic course.

31*st*. Involuntary movements are chiefly, if not entirely, in the muscles of the shoulder, especially in the deltoid and biceps; sensations for touch and pain are present over the front and back of forearm, but not so acute as in the corresponding parts of the right arm. There are some involuntary movements of the triceps and at the left wrist. Sensations for touch and pain in the palmar surface of the hand are lost. They are present in the dorsal aspect of the hand, but only to a limited degree.

April 8th. Patient feels greatly benefited by the operation. It is probable that subsequent operations will be performed, directed toward controlling the athetoid movements of the shoulder muscles.

FIG. 12

Photograph taken in December, 1905, showing the flexion of the right forearm on the arm

17*th*. Second operation on left upper extremity performed by Dr. Van Kaathoven. The circumflex and musculocutaneous nerves were divided and an end-to-end anastomosis effected between the central end of the one and the distal end of the other, and *vice versa*.

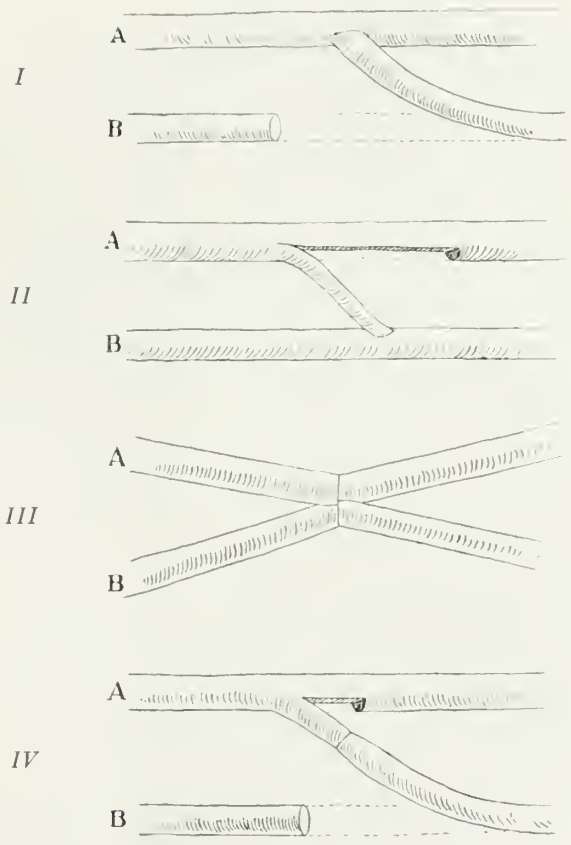
22*d*. The patient has been very much more comfortable since the last operation. The muscles of the shoulders do not contract as violently as before, but there still seems to be a marked tendency toward extension in the forearm.

24*th*. There is some involuntary jerking on the radial side of the forearm, but this movement is slight and is in the supinator longus muscle. Involuntary movements around the shoulder have ceased. The patient seems to have no sensation for touch or pain in the palm of the hand, although it is present to some extent on the dorsal surface of the hand.

May 5th. There is very little jerking of the left upper limb, and what involuntary movement is seen is chiefly in the supinator longus muscle. The whole

limb is somewhat spastic. There is considerable voluntary movement at the wrist and he can flex and extend the hand, especially when he is not excited. He can partially flex all the fingers, and the flexion is greater in the fingers nearer the ulnar side. Attempts at voluntary movements of the left hand increase greatly the athetosis of the right upper limb. The muscles of the

FIG. 13



Diagrammatic representations of various modes of anastomosis. *A* represents the unaffected *B* the affected nerve.

left hand are somewhat wasted. Sensation has not returned at all in the palm of the left hand. Sensations of touch and pain are present in the left forearm anterior aspect, but diminished in the posterior part of the left forearm and left hand. Some sensation is felt in the dorsal aspect of the ulnar distribution of the hand, but none on the palmar surface of this nerve supply.

Dr. C. S. Potts reported that on this date he could detect no reaction in the muscles supplied by the ulnar and median nerves with the faradic current.

July 10th. Left upper limb. Tactile sensation is lost in the ulnar side of the palm, and is felt slightly in the median side of the palm and on the anterior surface of the forearm. It is prompt in the posterior portion of the forearm, and is impaired in the outer, posterior, and inner portions of the arm. Motion: he has partial flexion of the fingers and more in the little and ring fingers, slight motion in the thumb. These movements of flexion of the fingers can be made without first extending the fingers. He has slight flexion of the wrist, more on the ulnar side (action of the flexor carpi ulnaris). He can flex the forearm upon the arm so as to touch the hand to the face, chiefly by the action of the supinator longus muscle. He can extend the hand on the forearm better than he can perform any other movement. (The musculospiral nerve was not cut.)

Dr. C. S. Potts made an electric examination November 7, 1905, and his report is as follows:

Right Arm. Deltoid, triceps, extensors of wrist, supinator longus respond well to the faradic current. The biceps responds; but not so well. In the median and ulnar distribution there is no response to the faradic current. AnCle greater than Kcle (Kcle very weak) marked nodal change. The same maintains for the left arm, excepting that the deltoid does not respond as well to the faradic current as the corresponding muscle on the right side does. Owing to the movements of the arms it is practically impossible to pick out the individual muscles with any more accuracy than is stated above.

REMARKS BY DR. FRAZIER.

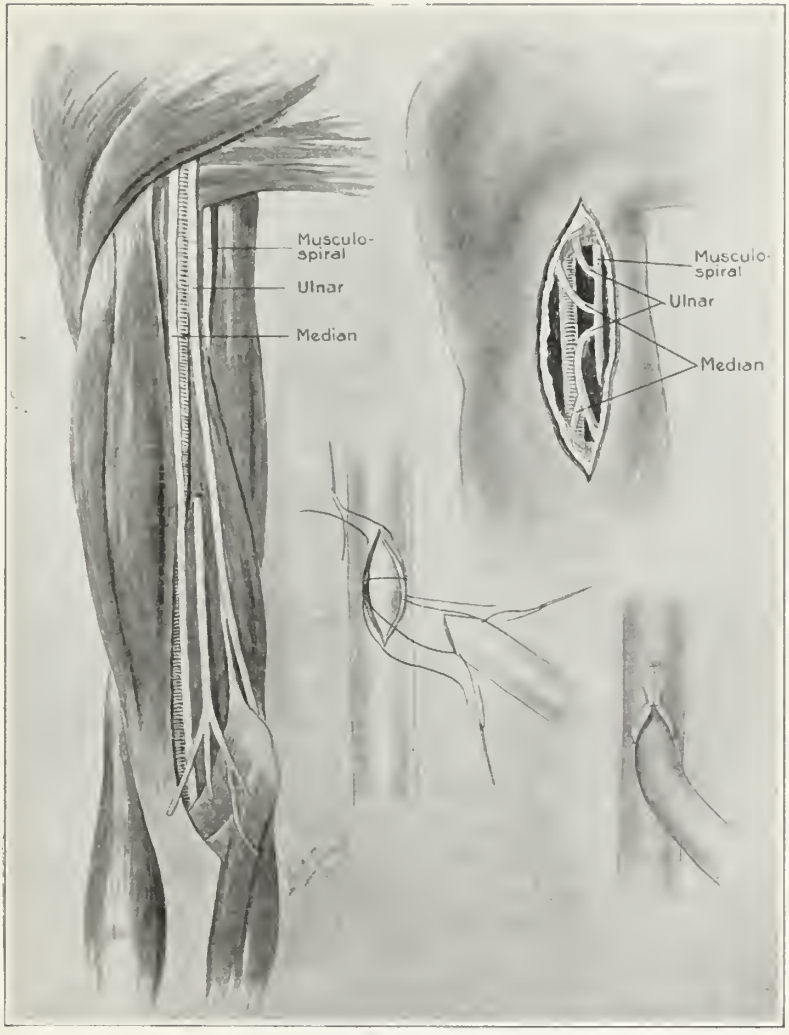
The central end of an efferent fibre can make functional connection with the peripheral end of any other efferent fibre of the same class, whatever be the normal actions produced by the two nerve fibres.[1] Such is the physiological law confirmed by repeated investigations first undertaken by Flourens[2] in 1824, upon which is based the principles of the operative treatment of palsies by nerve transplantation.

This principle is applicable to all forms of paralysis—to infantile spinal paralysis, to facial paralysis, to the paralysis due to traumatism of the peripheral nerves. Having proven beyond question of doubt the propriety of practising nerve anastomosis

[1] Langley and Anderson. Journal of Physiology, 1904, vol. xxxi.
[2] Ann. des sci. naturelles, 1824, tome iii., p. 113.

upon selected cases of infantile paralysis, there remains to be considered from the surgeon's point of view the mode of pro-

FIG. 14



(*a*) To the left a sketch of the normal anatomical relations. (*b*) To the right and above, the manner in which the anastomoses were made in the operation on the left arm. (*c*) To the right and below, the introduction of sutures for a lateral anastomosis, two anchor sutures and a mattress suture.

cedure. Several methods have been proposed, and with each method the results have been variable. Too few cases have as yet been reported to enable one to deduce any conclusions based upon positive clinical data. The advantages which may be claimed for one method or another must be based chiefly upon theoretical grounds. These deal chiefly with the biological problems concerned with the regeneration of nerve fibres. Inasmuch as at the present time two so radically different theories as to nerve regeneration are entertained, it is not to be wondered at that different views should be held by surgeons as to the best method of effecting the anastomosis. These are:

1. Lateral anastomosis of the peripheral segment of the nerve to the paralyzed group into the nerve supplying the unaffected group of muscles.

On theoretical grounds, at least, it may be assumed that the best results will follow an end-to-end anastomosis. No matter which theory one accepts, the central or peripheral, the best opportunity for one set of nerve fibres to unite with another is afforded by bringing into apposition the free ends of one with those of the other. When applied to the treatment of infantile palsy there is a strong objection to this method. We must bear in mind that there has been a certain percentage of failures, and one hesitates, therefore, to adopt a procedure which may aggravate rather than improve the condition existing prior to operation.

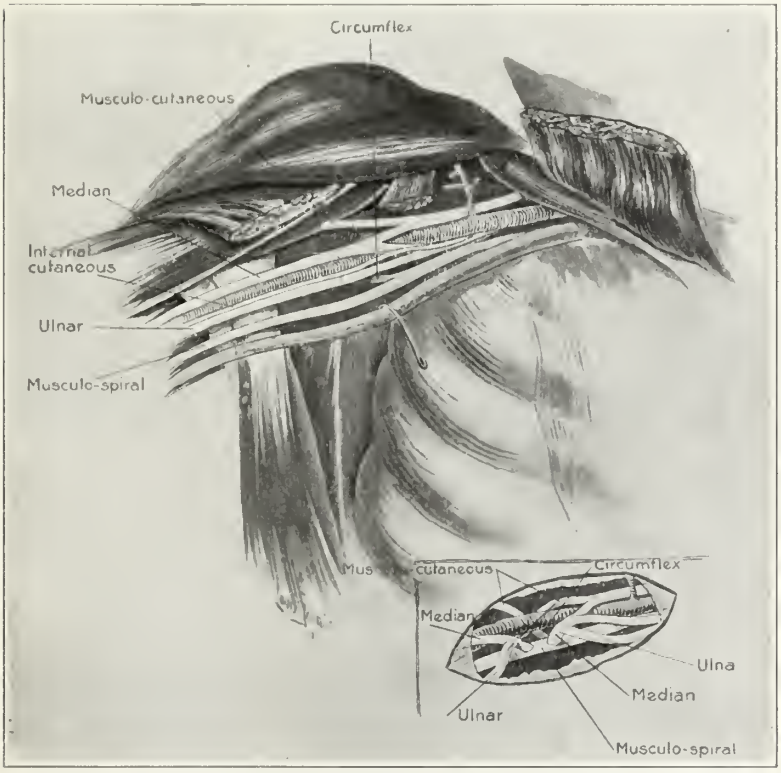
Thus, for example, if we split off from the unaffected nerve a flap with which to establish an end-to-end anastomosis with the affected nerve, we are robbing the healthy group of muscles of a portion of its nerve-supply, and may thereby permanently weaken that particular group. Dr. Spiller and I have therefore preferred the lateral anastomosis—that is, implanting the peripheral segment of the affected nerve into the unaffected nerve where the paralysis is not extensive, recognizing and acknowledging the possibility of failure in a certain percentage of cases.

2. End-to-end anastomosis of the peripheral segment of the

affected nerve with the central end of a segment split from the unaffected nerve. (See Fig. 13, No. IV.)

Should, however, with the perfection of the technique and with additional clinical experience, it be clearly demonstrated that there

FIG. 15

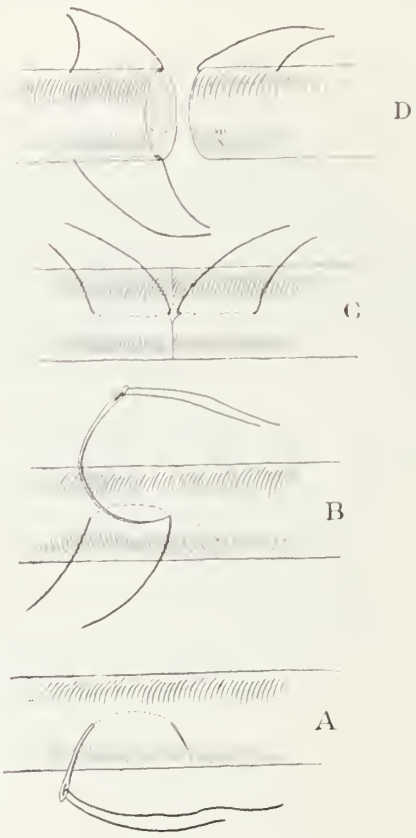


(*a*) Showing normal relations of nerves and vessels. (*b*) To the right and below, a sketch showing the way in which the anastomosis was effected in the operation on the right arm.

is sufficient assurance of restoration of function to the paralyzed muscles to warrant such interference with the nerve supply of the healthy group, this would be the operation of choice, and this or the operation following would probably be necessary where the paralysis is in several muscles.

3. Lateral anastomosis of the central end of a segment split from the unaffected nerve into the affected nerve. (See Fig. 13, No. II.)

FIG. 16



A, *B* and *C*, showing the way in which the sutures are introduced before the nerve is divided *D*, showing the nerve after division with sutures in place.

My attention was first called to this method of establishing an anastomosis by Hackenbruch.[1] Referring to Fig. 13, Nos. I and II., it will be seen at once that one method is exactly the reverse of the other. Believing in the central rather than the peripheral theory of regeneration, Hackenbruch thinks this is the more logical

[1] Loc cit.

mode of procedure. He believes that there would be a very much greater opportunity of functional union between the affected and the unaffected nerves if a flap from the unaffected nerve is engrafted into the affected nerve, since by this plan the young axis cylinders which sprout out from the central stump will almost surely find their way into the fibres of the paralyzed nerve. If, on the other hand, the paralyzed nerve is cut and grafted into the healthy nerve, accepting as he does the central theory of regeneration, he believes it more or less a matter of chance whether the new axis cylinders of the healthy nerve will find their way into the fibres of the paralyzed nerve.

4. End-to-end anastomosis of both central and peripheral ends of the affected nerve into the split segments of the unaffected nerve. (See Fig. 13, No. III.)

Dr. Spiller has already referred to Basil Kilvington's investigations. The latter, as the result of his experience with dogs only, recommends an end-to-end anastomosis, using both peripheral and central segments of the affected nerves, on the grounds that there may be a few fibres in the affected nerve which are functionally active and should not therefore be sacrificed. This operation might be applied with reason to those cases in which there is only partial and not complete paralysis in the affected group. The suggestion is not a practical one, however, since one would hesitate to recommend an operation where there was only partial disturbance of function. As to his recommendation that both the affected and unaffected nerves be divided before the anastomosis is effected, Spiller says this hardly seems a wise procedure. I would go still farther and call it distinctly an unwise procedure.

5. Lateral anastomosis of one or more muscular branches of the affected into the unaffected nerve.

This method is applicable of course to those cases in which but a single muscle is affected. Thus in a patient of Dr. Spiller's (case unpublished) the paralysis was limited to the tibialis anticus. The other muscles of the extensor group were not affected. Under such circumstances it is manifestly unwise

to tamper with the nerve supply of the entire group. Accordingly the three minute branches supplying the tibialis anticus were divided and implanted into the musculocutaneous.

Once having determined upon the general plan of procedure, there remains to be considered the details of the technique. These will be taken up in the discussion of the operation for athetosis. (See p. 208.)

The principles underlying the application of nerve anastomosis in the treatment of athetosis have been referred to by Dr. Spiller. The first operation was performed March 16, 1905. An incision 4½ cm. long was made along the course of the brachial vessels and nerves in the upper half of the left arm. The ulnar nerve was exposed and freed from the areolar tissue throughout the length of the incision. The median nerve was exposed and isolated above the point at which it crosses the brachial artery and the musculospiral nerve for an equal distance. After the introduction of four sutures about 1 cm. apart into the ulner nerve—two on either side—the nerve was divided between the two sets of sutures and the proximal and distal ends, respectively, implanted into the musculospiral. Four sutures were introdueed in a similar manner into the median nerve, and after the nerve was divided the central end was implanted into the musculospiral nerve and the distal end was implanted into the ulnar nerve. The latter step was adopted because it was feared that too much traumatism might be inflicted upon the museulospiral if each of the four ends of the divided median and ulner nerves were attached to it. The distal end of the median nerve was attached, therefore, into the distal segment of the ulnar nerve. The precise manner in which these anastomoses were made is graphically depicted in Fig. 14. At the points of anastomosis the nerves were enveloped with cargile membrane, the wound closed with interrupted silkworm-gut sutures, and a plaster-of-Paris bandage applied over the dressing, binding the arm to the side. Despite the applieation of the fixation dressing it was not possible to keep the limb absolutely

quiet, owing chiefly to the frequent and violent contraction of the biceps muscle, whose nerve supply had not been interfered with. The seat of operation was subjected to so much disturbance through the uncontrollable activity of this muscle that I feared the process of union and regeneration might be seriously interfered with. Accordingly, on April 17th, under my direction, Dr. Van Kaathoven performed upon the same arm a second operation, designed to regulate the movements of the biceps muscle. An incision about 10 cm. long was made along the line of the axillary vessels and brachial plexus. The pectoralis major muscle was partially divided in order to afford a freer exposure. The circumflex and musculocutaneous nerves were isolated, their identity tested with an electric current, and two pairs of sutures introduced into each nerve. The nerves were divided between each pair of sutures and an end-to-end anastomosis effected in the following manner: The central end of the musculo was sutured to the peripheral end of the cutaneous circumflex nerve and the central end of the latter sutured to the peripheral end of the former. The nerves at the point of anastomosis were enveloped in cargile membrane, the wound closed, and the arm bandaged firmly to the side. On June 13, 1905, encouraged by the results of the operation on the left arm, it was decided to carry out very much the same procedure in the right arm. The performance of this operation I entrusted to Dr. Van Kaathoven. An incision about 7 cm. in length was made over the brachial and axillary vessels, dividing the skin, superficial fascia, and about 2 cm. of the pectoralis major muscle. This incision exposed the vessels and brachial plexus. Each nerve was freed in turn. The musculocutaneous and circumflex were divided and subsequently sutured in the following manner (see Fig. 15); the proximal portion of the circumflex into the distal portion of the musculocutaneous and the distal portion of the circumflex into the proximal portion of the musculocutaneous. The median and ulnar nerves were then divided, and a lateral anastomosis effected between the distal portion of the median and the musculospiral and between the ulnar and median. Similarly on the proximal

side the proximal ends of the median and ulnar were united by lateral anastomosis. The muscle wound was closed with a double row of catgut sutures; the skin wound with interrupted silkworm sutures. A piece of rubber tissue as a drain was inserted into the apex of the axilla.

Technique. Too much stress cannot be laid upon the importance of paying the strictest attention to details in the performance of operations dealing with the cranial or peripheral nerves. The nerves themselves must be subjected to a minimum degree of traumatism, otherwise the process of regeneration will be materially interfered with. To this end the nerves themselves should never be grasped with forceps. In order to avoid the necessity of steadying the nerve while the suture is being introduced we make it a practice to insert the suture before the nerve has been divided. (See Fig. 16.) If this precaution is taken it will not be necessary at any stage of the operation to grasp the nerve with forceps. When a nerve has to be divided it is very much better to use a sharp knife than a pair of scissors. The latter necessarily pinches and bruises the nerve fibres. It is scarcely necessary to call attention to the impropriety of including in the sutures any portion of the nerve but the sheath. If any nerve fibres are included in the suture these fibres will be so squeezed and crushed when the suture is tied that they will undergo degeneration. Anything which excites the formation of an excess of cicatricial tissue in or about the site of the anastomosis should be scrupulously avoided. The success of the operation depends: first, upon the nicety with which the apposition is effected and maintained, and secondly upon the amount of cicatricial tissue at the site of anastomosis. The freer the nerves are at the point of anastomosis from the invasion of scar tissue the better will be the results. Everything which excites the tissues to more or less intense reaction, and therefore to the development of scar tissue, is a menace to the operation. Thus wound infection is almost invariably fatal to success. The dissection should be as delicate as possible, so that a minimum degree of traumatism be inflicted upon the tissues. The incision

should be made preferably to one side or another and not directly over the course of the nerve. The minimum number of sutures should be used, and after the anastomosis has been effected the nerves should be enveloped with cargile membrane to prevent the invasion of scar tissue. As to the technique to be observed in the introduction of the sutures, this will vary somewhat upon the way in which the anastomosis is to be made. In an end-to-end anastomosis two or three sutures will suffice to maintain apposition. In a lateral anastomosis the sutures should be introduced in the way illustrated in Fig. 16. Before dividing the nerve two sutures are introduced, one on either side only through the sheath. These sutures, when passed through the sheath on either side of the slit in the undivided nerve, are tied, and serve to anchor one nerve to the other. In order to close the slit in the sheath, and also to prevent the tip of the nerve from becoming disengaged, a third suture is needed. To meet both these indications I have found a modified mattress suture very satisfactory. (See Fig. 15.)

After the dressing is applied the limb should be encased in a plaster cast in order to ensure absolute rest, and I think it advisable to keep the limb perfectly quiet for four to six weeks. At the end of this period the cast is removed, and the patient is then allowed to use the limb. The success of these operations depends in large measure on the faithfulness with which the after-treatment is carried out. Massage, galvanism, and prescribed exercises must be insisted upon and continued for six months to a year—continued as long as the condition is improving.

Results. Whether or not the results of this operation will prove that an equalization of power or force between the two groups of muscles—the flexors and extensors—will be established remains to be seen. It will be interesting to note what influence the innervation of the musculospiral nerve will have upon the muscles supplied by the ulnar and median, and, *vice versa*, what influence the innervation of the median and ulnar nerves will have upon the muscles supplied by the musculospiral. What

will be the effect upon the extensor group of the transmission of the stronger impulses from the central segment of the median and ulnar nerves into the musculospiral nerve? Will these same impulses be diverted again from the musculospiral nerve into the peripheral segments of the median and ulnar nerves, or will there be no direct communication between the fibres of the proximal segments of the median and ulnar nerve with those of the distal segments? What would be the effect of stimulating electrically the central segment of the median or ulnar nerves? Would we get response in the distribution of the musculospiral nerve alone or in the median and ulnar nerves, too? These are some of the interesting questions that suggest themselves, and no doubt a number of instructive phenomena concerning the transmission of nerve impulses and nerve regeneration may be observed in the case upon which we have operated. That one nerve can perform the function of another when both are philosophically united is a matter of common knowledge. Thus, for example, in cases of facial palsy we know that after anastomosis of the facial nerve to the hypoglossal or spinal accessory nerve either of these nerves may transmit impulses directly to the muscles supplied by the facial nerve as well as to those muscles over which they originally presided. That the cortical centres of one nerve may be educated to preside over those of one or more is also an accepted phenomenon. Taking these physiological laws into consideration, it has occurred to me that in case the present plan of anastomosis which we have adopted in the treatment of athetoid movements is not successful, we might go even farther than Dr. Spiller has suggested. Thus, for example, we might cut off entirely the connection of the nerve supply of the flexor group by permanently disconnecting the central segments of the median and ulnar and relying entirely upon the musculospiral nerve, innervating the flexor group through its anastomotic condition with the distal segments of the median and ulnar nerves.

As to the results which have actually been obtained in the patient upon whom we have operated, we are able to make a favorable preliminary report. After recovering from the par-

alysis immediately following the operation the patient is regaining power in the distribution of the flexor group, and, as will be seen in Figs. 4, 5, 6 and 7, he is now able in the left extremity to voluntarily flex the fingers, the wrist on the forearm, and the forearm on the arm. At the last examination, November 6, 1905, the following notes were made by Dr. Spiller:

Left Upper Limb. There is still some stiffness of the entire limb, but this is not always present. The limb jerks very little when the man wishes to hold it quietly and is not excited, but sometimes there is slight jerking on voluntary movement. When the left hand rests on some support he can almost fully extend the first finger and can extend the other fingers partially. He can partially flex all the fingers and can flex the wrist almost to a right angle, the power being greater on the ulnar side. He can flex the forearm on the arm to about the normal extent, and can partially raise the arm at the shoulder. Sensations for touch and pain are normal in all parts of the left upper limb, except in the palm of the hand, where there is still much impairment in the ulnar distribution. He cannot approach the thumb to the little finger. Muscular atrophy is slight.

Right Upper Limb. He still has athetoid movements at the shoulder, but they are apparently entirely or nearly entirely in the latissimus dorsi and muscles on the scapula, as the arm is drawn downward and backward during the spasmodic movements. He has slight return of power in the flexors of the fingers, but has much power in the extensors of the wrist. He flexes the forearm to a right angle with the arm and elevates the arm to a right angle with the trunk. He has much less involuntary jerkings at the right shoulder when he is not excited. Sensations for touch and pain are normal in the limb, except over the anterior aspect of the forearm and in the ulnar and median distribution of the hand.

There is therefore partial flexion and extension of the fingers of the left hand, much power in flexion and extension of the left hand on the forearm, and of the left forearm on the arm, and in elevation of the left arm at the shoulder. These movements are made with difficulty.

The return of power in the right upper limb is not yet so good as in the left, but this is because the operation on the right limb was performed more recently. The athetoid movements at the shoulder are in muscles that have not been operated upon. The voluntary movement present in the right limb is shown by slight flexion of the fingers, extension of the hand on the forearm, flexion and extension of the forearm on the arm, and elevation of the arm at the shoulder.

The electric reactions are reported in the case history.

DISCUSSION.

Dr. James K. Young: I have had no experience with the operation for athetosis, but have operated in cases of infantile spinal palsy. Three cases were operated on in which I used the lateral anastomosis. Instead of using a knife to divide the nerve, the irideetomy scissors were used, which I found perfectly satisfactory. The incision in the sound nerve was made with Graefe cataract knife. After dividing the nerve I used the irideetomy forceps to insert the nerve into the lateral anastomosis. The sutures were of the finest 00 chromicized catgut. I always divide the nerve before the sutures are applied, grasping the fascia surrounding the nerve, and the sheath is caught on the distal side of the nerve.

I saw this case after the operation and the movements were very much better than they are this evening, possibly because the patient is excited. I consider it a very excellent result.

REPORT OF A CASE OF SUCCESSFUL SUTURE OF A PENETRATING WOUND OF THE HEART.[1]

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WITHIN the past three years I have made two contributions to the subject of penetrating wounds of the heart, the last of which was read before this college in May, 1904 (*American Journal of the Medical Sciences*, September, 1904), and it is my intention to-night briefly to rehearse the details of a case of successful suture of a stab wound of the right ventricle, and to make a few comments on the symptoms and treatment. This case is the second one in which I have operated, the first having died on the table (*Philadelphia Medical Journal*, November 1, 1902).

A. C., aged thirty-eight years, a well-developed, healthy colored man, was admitted to the Bryn Mawr Hospital on the night of July 30, 1905, at 12.20 o'clock. He had been stabbed with a "penknife" about one hour previous to his admission; immediately after the stabbing he was able to walk a short distance, but then fell to the ground and soon became unconscious. His friends brought him to the hospital in a cab. At the time of his admission he was completely unconscious, the reflexes were lost, the pupils dilated, skin cold and moist, finger nails cyanosed, respiration very rapid and shallow; there was no pulse in the peripheral vessels, and the heart sounds were very distant, rapid, and irregular. The patient's clothing was saturated with fresh blood and an examination showed three stab wounds, one at the bend of the left elbow, one just below the edge of the pectoral muscle in the left axilla, and a third about three-fourths of an inch to the left of the sternum and on a line with the fourth costal cartilage. This latter wound was more extensive than

[1] Read December 6, 1905.

either of the others and measured about one and three-fourths inches in length, extending upward and outward. At the time of admission the first two wounds were not bleeding, but a small amount of hemorrhage was taking place from the wound over the heart, which was partly filled with clot. The area of cardiac dulness was decidedly increased. The patient was given vigorous stimulation and in about half an hour his condition had improved somewhat and he could be partially aroused. I saw the patient about 1.45 A.M. with Dr. Branson, who assisted me in the subsequent operation, and thought from his symptoms that he at least had a wound of his pericardium and that this sac was filled with blood, making pressure upon the heart. The patient had improved considerably since his admission, and when put upon the operating table he could be aroused sufficiently to give his name. He had had morphine and atropine and it took but a small amount of ether to produce anaesthesia. An exploration of the wound over the heart showed that the fourth costal cartilage had been completely severed transversely. The wound did not extend beyond the cartilage, and it is this fact which prevented blood escaping readily from the pericardium. When the cartilage was manipulated a quantity of blood escaped between its divided ends. The entire cartilage, with a portion of the rib itself, was removed with rongeur forceps. Exploration of the pericardium then showed a wound which would admit the end of the index finger. This wound was increased in size and the pericardium found filled with blood clot and liquid blood. The patient's pulse had improved under the ether, but it was much fuller and more regular after the evacuation of the pericardium. The heart rapidly filled again with fresh blood and I had considerable difficulty in locating the wound in the heart itself. In my former case I had no trouble of this kind, as on passing my finger over the surface of the heart it readily discovered the opening. Being unable to discover the wound by digital examination I put two fingers behind the heart, lifted it up to the pericardial opening and, rapidly sponging away the blood, was able to see the wound, which was partially filled with clot. It was situated in the right ventricle near the auriculoventricular groove. The bleeding from this wound was very free, but could be readily controlled by digital pressure. It readily admitted the tip of the index finger and measured from one-half inch to three-fourths inch in length. The opening in the pericardium seemed about one-half as long as the external wound. A traction suture of chromicized gut was then rapidly passed through both edges of the wound and the heart held firmly up against the pericardial opening. Then four other sutures of chromicized gut were introduced with an intestinal needle. The traction suture had been put in with a spear-pointed needle and there was considerable oozing from the punctures. This I controlled with an additional suture passed with an intestinal needle. The traction suture was of the greatest aid in the passage of the others, and without it it would have been very difficult to have closed the wound, as the heart muscle was continually contracting and expanding I made no

effort to avoid the endocardium in passing the suture, as I think it is more important to close the wound throughout the thickness of the heart wall than to avoid entering the endocardium. A small gauze drain was placed against the line of heart sutures and brought out through the pericardial opening in which no sutures were placed. In order not to prolong the operation, I simply packed the external wound also. The patient went off the table in very satisfactory condition: pulse 88, respiration 32. The pleura was not injured and I was careful to avoid it in my manipulations.

During the subsequent twelve hours there was considerable serous oozing, requiring a change of dressing. At this time the patient's pulse was 112, respirations 36, and temperature 101°. He complained of considerable pain in the left shoulder and chest. The second day after the operation his condition was quite alarming, the respirations having gone up to 62, and he complained of great distress in the chest. I changed the dressing at this time and found that the gauze packing had become so dry and adherent to the wound as to interfere with drainage. I withdrew the gauze and a large quantity of fluid from the pericardium escaped with a gush. A smaller drain was introduced and a moist dressing applied, in order to ensure drainage. The patient was immediately relieved, and the respirations fell to 38 within a short time. Large quantities of salt solution were given by the rectum and readily absorbed. On the second day the patient took liquid food with relish. Excepting for the distention of the pericardium due to faulty drainage, the patient made an uncomplicated recovery. The dressing was changed every other day, and on each occasion for some time the pulsating heart could easily be seen. On August 5th, six days after the operation, I introduced several catgut sutures into the external wound and closed it nearly completely, but no sutures were put in the pericardium, the wound in this structure having nearly closed. On August 7th the pericardial wound had entirely closed. On August 10th he sat up in bed, and on the 13th was out of bed. On the 19th, twenty days after his operation, he was discharged with a superficial granulating wound. On September 10th he returned to work as a master plumber and tells me he has not lost a day since. At the present time he is perfectly well and has not the slightest discomfort or pain about the wound. His heart action is regular and normal.

In reviewing the symptoms in this case it will be readily seen that they were those of compression of the heart, and not those of simple profuse hemorrhage. The unconsciousness, the embarrassed respiration, the absence of pulse, the cyanosis, the feeble and irregular heart sounds, together with the increased cardiac dulness, indicated plainly compression of the heart due to hemor-

rhage into the pericardium. The absence of signs of fluid in the pleura indicated that this membrane had escaped injury. I think that it is important to determine, if possible, before operating for wounds of the heart, whether or not a wound of the pleura has taken place, since it may influence the choice of the method of exposing the heart. In neither of my cases was the pleura injured. In the first case, however, I produced a small wound of the pleura in resecting the cartilage. I was able to avoid this complication in the present case. Unless one is able to demonstrate a wound of the pleura I do not believe that it is wise to make the osteoplastic flap, which is generally recommended, but that it is better to separate the periosteum and excise so much of the cartilage, sternum, or rib as may be necessary to give free access to the wounded heart. In the present instance I had ample room, and after the introduction of the traction suture had not the slightest difficulty in closing the heart wound. Two fingers behind the heart are quite enough to lift it up where it can be plainly seen and the traction suture introduced. After the introduction of this suture the rest of the operation is easy. In making the osteoplastic flap it is very difficult to avoid injury of the pleura. In but a few reported cases has the pleura escaped injury.

I shall be careful in my next case, if I am fortunate enough to have another, not to use any other than a curved intestinal needle, as the beveled needles produce considerable hemorrhage. I think also in a future case I shall not drain the pericardium, but close it at once, since it has been shown that after complete closure it does not become distended with fluid. The accumulation in this case was probably due to the irritation of the heart surface by the gauze which I employed. Drainage of the external wound, however, I believe should always be employed. A large percentage of the cases which have been operated upon for penetrating wound of the heart have died from infection, and in a considerable proportion of those who have recovered the cure has taken place in spite of infection. I expected suppuration in this case, as there was little opportunity to thoroughly sterilize

the skin, and was agreeably surprised that the wound healed entirely without the slightest infection. The temperature chart shows that the highest temperature which the patient had was 101° on the day after operation, and that after a few days it remained normal.

It is remarkable that, although the first successful operation of stab wound of the heart was done in 1896, less than ten years ago, there have already been reported 100 cases, and the percentage of recovery has been surprisingly high. Dr. F. T. Stewart, in a paper which he read before the College in May, 1904, and in which he reported a successful case, showed a collection of 60 cases, with a recovery rate of nearly 40 per cent. Since his paper was published there have been a number of successful cases reported by foreigners, but I have been able to find no successes reported by American surgeons. If I am correct in this, the case which I report is the fifth successful one in this country.

This subject was so freely discussed at the meeting of the college to which I refer that I hesitate to go more deeply into the question of statistics and technique. Before closing, however, I would state that there are constantly reported cases in which patients have lived for a number of hours or days after stab wounds of the heart, and that a correct diagnosis has not been made until after death. Whenever there is a question of wound of the heart an exploration should be made, just as it is made in questionable wounds of the abdominal wall. Too vigorous stimulation, such as the intravenous injection of salt solution, is to be strongly condemned in these cases until after the heart wound has been closed, and even then should be employed with caution.

DISCUSSION.

Dr. Francis T. Stewart: It is often impossible to diagnosticate a wound of the heart. The superficial wound may be directly over the heart and associated with symptoms of profound shock, and yet the heart escape injury; moreover, the wound of entrance may be in the abdomen or in the posterior aspect of the chest, the constitutional symptoms slight, and a fatal wound of the heart exist. I presented a case of suture of the heart to the College about a year ago, and since then have seen one other case of wound of the heart in which death occurred before arrangements could be made for operation. During that time I have also seen three other cases of wounds in the vicinity of the heart. In one case—that of a colored boy—the wound was directly over the heart. Symptoms of shock were profound, but on exploration the wound was found not to have penetrated the thoracic wall.

The second case was a gunshot wound over the apex of the heart, the man having been shot by a policeman whom he had knocked down, the bullet therefore ranging upward. The symptoms of shock were profound, and the whole left chest was tympanitic. On exploration it was found that the bullet had gone backward and grazed the pericardium, but had not touched the heart.

A third case I saw about two weeks ago. The man had shot himself directly over the heart, the bullet entering midway between the left nipple and the sternum. There were symptoms of profound shock and of pneumothorax. The heart could be heard, but the sounds were very distant and indistinct, and there was no radial pulse. The patient was conscious, however, and the mind alert. Here exploration also revealed that the bullet had gone through the anterior margin of the left lung and then passed backward between the heart and the pericardium. There was little blood in the pleural sac and none in the pericardium.

The safest plan in all cases of wound in the neighborhood of the heart is exploration. The superficial wound may be enlarged by a transverse incision along the rib or between the ribs and gradually deepened to ascertain whether it penetrates the chest, and, if it does, the entire depth of the wound should be sufficiently enlarged to explore the heart. Occasionally it is possible for the operator to put his finger directly into the cardiac wound. In other cases it will be easy to resect the rib above or below, and thus obtain ample room for exploration. There have been several cases in which the operator has opened the pericardium, but has failed to find the wound in the heart, and has closed the chest without suturing the wound, with death as a result. Dr. Gibbon's case bears this statement out in that it took him some time to find a wound which was from three-fourths to an inch in length.

Since my paper, presented a year ago, there have been a number of other cases. Guibal collected 66 cases in which sutures were applied, and 5 in which death occurred during the operation. I have in addition to these references to about a dozen other cases. Of the 66 cases 26 recovered, or 39.3 per cent., and of the fatal cases, in 45 per cent. death was due to infection. Fifty per cent. of the recoveries were complicated by infection, so that you see what a large factor infection is in both producing death and delaying convalescence.

All that remains to complete the history of suture of the heart is the end results of those that survive. Thus far, cases have not been reported long after suturing. Dr. Gibbon's patient evidently has no trouble. The patient I reported works as janitor and has no symptoms referable to the heart.

In addition to these cases there are seven others of which I have record. In one case there were symptoms indicating an aneurysm of the heart. In another case there are symptoms of tachycardia, said to have been present before operation. The other six cases are in perfect health, with no symptoms referable to the heart. These cases are recorded at periods ranging from a few months to several years after operation.

Dr. James Tyson: Dr. Stewart's remark referring to the possibility of wounding the heart from behind reminds me of an experience of my own some time ago, when I had under my care a case with symptoms and physical signs of a dilated bronchus. Dr. Pepper saw the case in consultation. It occurred to us that it might be well to open the dilated bronchus from behind and drain it. Dr. White did the operation. A portion of a rib was exsected, and there under our eyes was the heart beating strongly more than from the front. The proximity of the heart to the posterior chest wall in this case seemed to be immediate, and there was very little lung between it and the opening in the chest wall. Moreover, it was exactly in the situation of the supposed dilated bronchus. It is needless to say we made no further attempt to explore the dilated bronchus, but speedily closed the opening.

Dr. J. C. Wilson: The question raised by Dr. Stewart as to the propriety of drainage in these cases, lest it should be followed by adhesions, seems to me not a serious one from the standpoint of the medical clinician. We know that more or less extensive pericardial adhesions often occur after various kinds of pericarditis, and without much modifying the physical signs in the precordial area or the signs related to the circulation. If from the surgical standpoint drainage is indicated, the possibility of development of more extensive adhesions should not deter the surgeon from draining. It is almost certain that extensive adhesions must take place in all these cases. In this case the patient has a faint mitral systolic murmur. He has also, I think, a very slight systolic dimpling, not sufficiently distinct, however, to be positively made out in the gaslight in which I have just examined him.

Dr. J. Alison Scott: It was about a year ago that Dr. Le Conte and I read a paper on the medical and surgical aspects of pyopericarditis and cited some three or four cases. Of the four cases three were operated on and all recovered. I have made a study of the physical signs referable to the precordial area since operation. As they were all pus cases they were all drained. I am not convinced that the heart really does become adherent. Examination of one case in the erect position shows the apex beat in the normal position, without dimpling. Putting the man first on the right side, the heart falls toward the ensiform cartilage; on the other side, the apex beat is seen beyond the nipple line. The second case has a modification of the same signs. I agree with Dr. Wilson that if the cases need to be drained they ought to be drained; for even with what we call bad cases, such as the pus cases, adhesions do not seem to retard recovery, and perhaps are not extensive even if they occur.

Dr. J. Sailer: It seems to me in wounds of the heart or pericardium the safest treatment is invariably surgical. I would like to cite two cases. One, a man, had been stabbed with the knife held in a slanting direction, and the wound was at the ensiform cartilage. There was history of extremely severe hemorrhage immediately after the wound, and he was desperately ill for some months. When I saw him he had a perfectly well-developed picture of pericardial adhesions, enlarged heart, dyspnœa, and all the symptoms of severe or obliterative pericarditis. In the other patient the history was not as clear. He was wounded in South Africa by a Boer bullet, that entered at the fourth interspace to the left of the sternum and emerged just above the scapula on the right side. It seemed that the heart was almost certainly injured. There were symptoms of obliterative pericarditis. I think if the blood is allowed to coagulate and form a clot there is possibly more injury to the patient than would result from exploratory operation, and if hemorrhage be present drainage of pericardial cavity.

Dr. John H. Gibbon closes: Dr. Stewart spoke of the results in eight cases, one of which was rupture of the heart at the point of healing some days after injury. I found such a case, but the wound was not sutured. It was one of those cases of stab wound of the heart in which the patient recovered without operation. The man had left the hospital apparently well, and in lifting a heavy weight displaced this clot and died. The diagnosis was made postmortem. I think if drainage of the pericardium can be avoided, it should be. Unless we are pretty sure of infection I believe it is better not to drain, not for fear of adhesions, but because I think we run greater risk of infection by drainage than by closing the pericardium and drainage down to it.

A CASE OF CEREBELLAR TUMOR.[1]

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Before presenting this communication upon a rather unusual case of cerebellar tumor I wish to state that the man in question was sent to me for ocular treatment by Dr. A. C. McMullin, of Kensington; and I wish also to thank Dr. William Turner Van Pelt for his care of the patient at the Episcopal Hospital during the last stages of his illness, and for his extreme courtesy in giving me the later history, which thus enables me to present the case in full before you to-night.

The patient, a young man aged twenty-six years, the fourth of eight children, had come from England in boyhood. He was a printer of cotton stuffs. He had passed through infancy and adolescence without serious illness. At about fifteen years of age he had an attack of insolation, from which he promptly recovered without sequelæ. His father died of heat-stroke four years ago. Recently a paternal uncle died of apoplexy. There is no history of tuberculosis or of cancer in the family.

At Easter, 1904, the young man was suddenly seized with a violent attack of headache, which lasted four days. There were no unusual symptoms associated; it caused no alarm and good health was regained. In July he was married and sailed for England. In midocean he felt very heavy headed, so he remained in his berth until noon each day for the rest of the voyage. Once he was seized with violent vomiting. These symptoms were thought by the ship's surgeon to be only those of seasickness. After landing, and on arriving in London, he had severe headaches, and, without previous dyspeptic symptoms, violent attacks of vomiting, which were projectile in character; then for a considerable period thereafter, until about September,

[1] Read December 6, 1905.

he had headaches on alternate days, the attacks usually taking place on awaking in the morning. He was not affected by sight-seeing tours. After September, until sailing for home in October, there were infrequent attacks. On the voyage he was very sick, having but two well days. On three of the days there were violent spells of vomiting. On landing, October 20th, he vomited from 2 o'clock until 8 o'clock A.M.

It was at this time that his physician, Dr. McMullin, was sent for. The young man was suffering intensely from pains in the head, in the occipital and frontal regions. These pains were usually most violent early in the day, subsiding at evening. All of the bodily functions at this time were apparently normal, but later, about the middle of November, the right side of the face became crooked, which continued for about a week. The tongue was not affected. Now for the first time it was noticed that the external rectus muscle of the left eye was paralyzed, and a day or so later diplopia, which was said to have been alternating in character, set in. This was followed by dimness of vision and photophobia. Except on the days of the headaches, when the arms and the legs felt numb, he was able to exercise and to take long walks without fatigue. The headaches had gradually subsided and a loss in bodily weight was rapidly regained. At no time had his friends noticed alteration in his gait or carriage. He felt well and reasonably happy. At times when he had his headaches he became irritable when the younger members of his household were noisy. This is not to be wondered at when we consider the fact that all of the family were members of an amateur orchestra. He had led a most pure life, and by his statement he was free from venereal disease, yet he was greatly annoyed by a painful priapism, which impelled him into inordinate sexual indulgence without gratification.

The man was sent to me on December 22, 1904. He was five feet seven inches in height, robust, weighing about 145 pounds, having a good, ruddy complexion. There was nothing remarkable in his gait or station. His movements about the darkened room were in the manner of one whose visual fields had been contracted. His expression was vacant, like the stare of one having optic neuritis. The tendon reflexes were apparently undisturbed; neither were disturbances of general sensation complained of, while objects and familiar utensils were handled with accustomed facility. His replies to my inquiries were clearly and concisely given, his memory being perfect and retentive.

The chief complaints at this time were referred to the ocular apparatus. The visual acuity of the right eye was reduced to 6/15, that of the left to 6/22.5. The accommodation power was abolished, so that Snellen's reading types could not be read. The optic axes markedly converged. The left external rectus muscle failed to effect parallelism. There was no nystagmus. Homonymous diplopia was complained of, but it was not possible to satisfactorily measure it. Except in outward rotation the muscular movements of the

left eye were unlimited. The pupils measured 4 mm. each, and were fixed, failing to respond to the usual stimuli; but when, however, the eyelids were forcibly closed, and after pressure on the frontales muscles, and then the eyes suddenly exposed to strong light, the pupils dilated widely. This paradoxical pupillary phenomenon was constantly obtained after repeated experiments. When the facial muscles were at rest the normal relations of the two sides of the face were disturbed (the left side was slightly drawn over to the right); when efforts were concentrated the relationship between the two sides became readjusted. The protruded tongue could be directed forward, though it was very tremulous. The visual fields were concentrically contracted; colors were not perceived and the blind spots were greatly enlarged. There was no history of polyuria, neither was albumin nor sugar detected.

Ophthalmoscopic Examination. The right pupil was not perfectly round, nor was there a reflex during the examination with the mirror. Fine granular deposits, resembling those of ciliary exudation, were noticed on the anterior capsule. There were no signs of antecedent iritis. Projecting into the clear vitreous was a greatly swollen optic nerve head, the summit of which was measured by a + 5 D lens. The retina was everywhere œdematous, the macular and foveal region remaining like a deep pit surrounded by the raised retinal sheet. No areas of exudation were discovered. The arteries were constricted and reduced to threads, while the veins were great, broad, tortuous currents. On the swollen nerve head were several flame-shaped hemorrhagic extravasations. The fundus conditions of the left eye were quite similar to those noted in the right, though they were more extensive and pronounced. The hemorrhagic extravasations on the disk, as well as those in the fibre layer of the retina, were larger and more numerous. These extravasations were like those seen in marked cases of hemorrhagic retinitis and other ocular diseases, and have frequently been noted in cases of cerebellar tumor. The intraocular symptom-complex differed, however, from that observed in the course of systemic disease. In the walls of the bloodvessels no signs of degeneration were apparent. The entrance and exit of the currents were mechanically interfered with by the choked disk.

In reviewing the history of the case the points to be observed are:

1. Head pains localized at the occiput, though at times radiating to the vertex.

2. Vomiting without nausea, nor dependent upon the ingestion of food; indeed, it invariably occurred in the morning.

3. The early development of an intense optic neuritis, the effects of which were relatively equal in the two eyes.

With these symptoms, so marked from the beginning, I was safe in assuming the case to be one of brain tumor. Of some special or localizing symptom, however, I was in doubt. There was the facial palsy, yet this had not remained constant in extent and duration. The pupillary reaction was paradoxical.

4. There remained to be considered only the abducens palsy. I could not help regarding this as of importance in connection with the other factors, and particularly the optic neuritis, in spite of the uncertainty of the causation of this symptom. There is no cranial nerve so liable to provide a distant symptom as the sixth. The lengthened course which this nerve takes over the most prominent part of the pons renders it readily affected by distant pressure. (Gowers, quoted by Swanzy.) I was fascinated by the presence of this symptom, and I boldly ventured the diagnosis of cerebellar tumor.

On December 27th he was admitted to the Germantown Hospital. Here he was confined to bed and a course of treatment was instituted, consisting of alteratives, diaphoretics, and salines. At the end of ten days the convergence and the diplopia had disappeared. The œdema of the retina and venous engorgement became remarkably reduced and no new hemorrhages were noted. The patient was then allowed to be out of bed and was given the freedom of the ward. At no time was there vomiting or headaches, neither was there disturbance of locomotion or change in station—of this there can be no doubt. The visual acuity of each eye remained unchanged. The optic papillæ remained as prominent as at the earlier examinations. During the patient's stay in hospital I was not a little surprised at the speedy regression of the symptoms. It was impossible for me to even guess at the kind of tumor contained within the cranial cavity. It surely was not an abscess. There had been no rise of temperature, and abscess predisposes less to optic neuritis than tumor, and I was disinclined to believe it to be a gummatous tumor, and yet the prompt cessation of all the symptoms, even the retina was less œdematous, which followed upon the thorough mercurialization, threw my thoughts into confusion. I felt justified, however, in allowing the man to return to his home.

On January 23, 1905, he was discharged from the hospital and I saw him repeatedly at my office. On February 13th, early in the morning, for the first time since December 20, 1904, there was an attack of vomiting, followed by much disturbance of the vision. At about 10 o'clock the man came alone to my office. The optic nerve heads were greatly swollen, the retinæ

intensely œdematous, while in the macular regions of each eye were large atrophic patches. On February 22d my notes record that he had indulged in walks of several miles without fatigue or disturbance of co-ordination. His wife had in the meantime begged me to forbid the taking of these long walks, because her husband usually had restless nights after such prolonged exercise. On this day—Washington's birthday—he again came to my office alone. He very greatly enjoyed mingling with and watching the crowds surrounding the President, who was visiting the city. On February 26th he suffered from intense right-sided headaches, and Dr. McMullin was called. There had been short periods of semiconsciousness and Cheyne-Stokes respiration, with irregular pulse. Two days later I met Dr. McMullin in consultation, for on this day there had been tonic convulsive seizures involving the arms, with stiffness of the back of the neck, occipital pains and tenderness and vomiting. At the hour I saw him—9.30 P.M.—he was absolutely free from all these symptoms. The pulse was slow and full; the grasp of the two hands strong and painful to me, and, except for the recollection of the frightful storm through which he had so recently passed, his cheerful disposition was unchanged. Neither fundus presented any new developments. I became all the more certain that there was a solid tumor at the base of the brain, located most probably in the cerebellar region. A return to hospital treatment was advised. On Thursday, March 2d, he was admitted to the Episcopal Hospital.

On admission the man was found to be weak and debilitated, yet without actual loss of power in his extremities. His intelligence was good and his memory retentive. The examination of the blood showed the presence of 4,240,000 red blood cells, 9400 white blood cells, and 90 per cent. hemoglobin. Neither albumin nor sugar were found in the urine.

The vision of the right eye was 20/70, of the left 20/200. The outward rotation of the left eye was somewhat impaired owing to a paresis of the external rectus muscle. All movements of the right eye showed no impairment of the extraocular muscles. In neither eye were nystagmic movements observed at any time. The pupils reacted normally to light, convergence, and consensually. The fields of vision remained contracted. The ophthalmoscopic examination showed great swelling of the retina, many splotches of degeneration, and small linear hemorrhages, and projection of the optic disks to 6 D.

The cardinal symptoms complained of were headache, loss of vision, and nausea. There was spasticity of the muscles of the neck, with retraction of the head. No abnormal signs were obtained in the physical examination of the thorax, while the pulse and temperature were normal. The man was put to bed; mercurial inunctions daily were ordered; only a light diet was allowed. At once marked improvement in general health followed and con-

tinued for ten days. There were no attacks of vomiting and but little nausea. He was greatly relieved of his headaches and expressed himself as feeling decidedly better. After two weeks the diet list was enlarged and potassium iodide in large increasing doses was prescribed. This lull was followed by a return of the storm in all its fury. The headaches were usually at the occiput; shooting pains, starting from the left frontal region, radiated to the parietal and the occipital. The head was retracted. Attacks

Tumor in left cerebellar region. X. Tumor.

of nausea and vomiting became frequent. The ocular conditions remained unchanged.

Shortly after admission Drs. Davis, Stevens, and Ring examined the patient with Dr. Van Pelt, and concurred in the opinion that the case was one of brain tumor, yet they hesitated to decide upon the probable location of the tumor because of the unsteadiness of any localizing symptom.

On March 18th, without loss of consciousness, there was a convulsion of the forearms, which lasted for several minutes. The hands became firmly clinched and flexed, while the forearms were flexed on the arms. Relief

followed after inhalations of chloroform. As the attack passed off the patient vomited. A similar, yet less violent, attack followed on the next day without vomiting, and three days later there was another seizure of shorter duration than the preceding ones. In this attack the patient was mildly rebuked by the nurse in charge and requested to control himself. The convulsion immediately ceased, and no similar nervous phenomenon followed.

By this time the patient had become prostrated; the symptoms were greatly intensified and the outlook more and more unfavorable. At night he was restless and delirious, while in the day he lay lethargic. On March 29th Dr. Wharton Sinkler was consulted. At this examination the patient could walk unattended, but in stepping forward he exhibited a distinct tendency to stagger and to fall toward the left side. The patellar reflexes were abolished. A diagnosis of cerebellar tumor was made with certainty, and the advisability of an operation to open the skull in the position best adapted for an exploration of the left cerebellar region was agreed upon. Although consent for an operation had been obtained from the patient's family, it was deemed wise to continue the medical treatment for a few days longer, and then transfer the patient to the service of Dr. Neilson, the attending surgeon on duty, he having agreed to perform the operation.

Unfortunately the diagnosis was not confirmed in the operating-room but at the necropsy, for on April 7th the patient was seized with a violent delirium, from which he fell into a comatose state and died suddenly four hours after.

Dr. Robertson, the pathologist of the hospital, was allowed to remove the brain, and Dr. Spiller has very kindly examined it. The result of his study of the tumor and the regions affected by it, together with remarks upon the clinical course of this very sad case, I am most fortunately able to have him present to you at the conclusion of this report.

It is interesting to speculate upon the probable result had operative procedures been instituted as soon as the abducens paralysis and the intraocular changes had become sufficiently pronounced to render the presumptive diagnosis of a cerebellar tumor positive.

In general the symptoms were those of intracranial tumor of the hind brain rather than of the more forward portions. They appear to be those produced by irritation rather than by the destruction of the basilar centres. Although the intense papil-

litis was conclusive of the presence of a tumor, the indefiniteness of the other symptoms hindered the assumption that the tumor occupied the cerebellar region. The chief focal symptoms were those of deviation of the optic axes, with disturbances of direct and binocular vision and facial palsy; yet, after energetic treatment, the paresis of the left external rectus muscle, as well as the diplopia and the facial palsy, greatly disappeared, and when the man was placed under strict hospital regimen the general symptoms all but ceased, for there were no headaches, emesis, or muscular spasms until the last course—after March 1st. The gait, station, and the knee-jerks were not interfered with until very late in the progress of the malady. There was hyperexcitation of the sexual functions almost until the end. The general bodily nutrition was maintained up to the last weeks of the man's life.

REPORT BY DR. SPILLER.

The tumor is situated upon the outer portion of the left lobe of the cerebellum, to which it is loosely attached. It is not at all infiltrating, but has made a depression in the left cerebellar lobe 2.5 cm. in depth. The tumor is very firm, almost globular, with somewhat irregular surface, and does not appear to have been adherent to the dura. It is 4 cm. in width, 5.5 cm. in length, and 5 cm. in thickness from above downward. When cut it appears friable and resembles a fibrosarcoma. It has caused some pressure upon the fourth ventricle and thereby moderate internal hydrocephalus of the cerebrum, although the aqueduct of Sylvius is not much dilated and the fourth ventricle not at all. The third and lateral ventricles of the brain are moderately distended, especially the posterior horn of the left lateral ventricle, the floor of which is forced upward by the pressure of the tumor upon the under surface of the left occipital lobe. None of the cranial nerves are implicated in the tumor. The microscopic examination shows that the tumor is a fibrosarcoma.

DISCUSSION.

Dr. William G. Spiller: The specimen is one of much interest. We often operate on tumors of the cerebellum, but I think I have never seen a tumor of the cerebellum which offered more favorable conditions for operation than did this tumor, situated as it was on the lateral portion of the left cerebellar lobe and not infiltrating the cerebellum in the least. From its location it would have been seen as soon as an opening were made in the skull. The chances are that it would have been entirely removed, and that the patient would have recovered with no return of symptoms. As it is a fibrosarcoma and very hard, it is not likely that it would have recurred. Anyone interested in cerebral surgery cannot but deeply regret that operation could not have been done, as if it had been done the case would probably have been one of the most brilliant on record. It is striking that there should have been involvement of the left external rectus muscle, because none of the cranial nerves were directly implicated in the tumor. The tumor being on the left side of the cerebellum, it must have distorted the left sixth nerve more than the right. It is remarkable that the right facial nerve was involved at all.

The improvement of symptoms under iodide and mercury does not mean that a tumor is a gumma. We are all familiar with the fact that the symptoms of tumors often disappear under the administration of mercury and iodide, at least for a time. The early choked disk and the character of the neuroretinitis might have suggested that the tumor was in the cerebellum.

APPENDIX.

ABSTRACT OF THE REPORT OF THE COMMITTEE ON MUTTER MUSEUM, 1905.

DURING the past year, numerous additions have been made to the collection in the Museum. Among these may be mentioned a curious case of old Japanese instruments, presented through Dr. J. V. Ingham.

A collection of books and old surgical instruments, formerly belonging to the late Dr. William Ashmead, of this city. Among these there is one of the early lithotrites, as originally designed by Civiale. These were presented by the Rev. Wm. Ashmead Schaeffer, D.D.

From Dr. W. S. Forbes, a very valuable case of lithotripitic instruments has been received. These are of the latest type, and embrace varieties of the crushers designed and employed by Dr. Forbes.

A number of ear, throat, and nose instruments and apparatus formerly used by the late Dr. Harrison Allen were presented by his widow, through Dr. W. W. Keen.

In April of this year, a collection of 1008 appendices removed by Dr. Deaver, at the German Hospital, were deposited by Dr. Deaver, and Dr. A. O. J. Kelly, the Pathologist of the Hospital, in the Museum. These specimens were accompanied by case histories, in the form of a card catalogue compiled from the hospital records. On these cards are given the main clinical points of the cases, and, in nearly every instance, the result.

From September, 1904, to April, 1905, more than 1200 students were instructed in the Museum, the demonstrations from the specimens having been made by Drs. W. L. Rodman, Charles H. Frazier, H. Augustus Wilson, G. M. Boyd, and W. J. Taylor. These oral lessons were highly prized by the sections of the student classes in attendance, who, in most instances, by resolutions in writing addressed to the Museum Committee, testified their high appreciation of the value of the Museum. The behavior of these visiting students has been faultless. Perfect order has always been maintained, and not a specimen has been injured or lost. Like instructions to similar classes is being continued this winter under the demonstration of the professors of the respective schools.

J. H. BRINTON,
Chairman.

ANNUAL REPORT OF THE LIBRARY COMMITTEE FOR 1905.

The number of volumes in the Library is (2218 more than at last report)	73,750
General Library	57,053
Lewis Library	13,288
S. D. Gross Library	3,192
Obstetrical Society Library	217
In addition to these volumes, there are	
Unbound "Reports" and "Transactions"	8,363
Unbound "Theses" and "Dissertations"	19,540
Unbound Pamphlets	56,265

Included in the number of volumes there are 1929 duplicates of some of the more important periodical publications retained as reserves to replace books that are worn out by frequent use.

The duplicates have been disposed of by sale or exchange up to June, but 498 have accumulated since and are now on hand. Four hundred and thirty-seven dollars and ninety-seven cents has been received from their sale and we have an exchange account to our credit with the New York Medical Book Company for two hundred and forty-nine dollars.

The Library receives regularly, by purchase or exchange, 478 periodical publications, including "Transactions" and "Reports," 105 American and 375 foreign—38 more than in the previous year:

	American.	Foreign.
Henrietta Rush Fales Baker Fund	0	23
William T. Carter Fund	0	3
John D. Griscom Fund	2	30
S. D. Gross Library	0	5
William F. Jenks Fund	2	26
Journal Association	1	12
Oliver A. Judson Fund	0	5
William W. Keen Fund	2	12
Library Endowment Fund	2	123

	American.	Foreign.
S. Weir Mitchell Fund	1	31
Philadelphia Medical Society Fund	0	7
Lewis Rodman Fund	0	9
John F. Weightman Fund	0	4
Caspar Wistar Fund	3	7
By Purchase	2	16
In Exchange	79	59

and also current numbers of 317 periodicals—the gifts of editors and publishers, and the exchanges of the following journals presented to the Library by the Editors:

American Journal of the Medical Sciences.
College and Clinical Record.
Medical and Surgical Reporter.
Medical Council.
Monthly Cyclopædia of Practical Medicine.
Therapeutic Gazette.
University of Pennsylvania Medical Bulletin.

We now exchange publications with the following schools:

University of Berlin.	University of Heidelberg.
" Bonn.	" Kiel.
" Breslau.	" Königsberg.
" Erlangen.	" Leipzig.
" Göttingen.	" Marburg.
" Greifswald.	" Strassburg.
" Halle.	"

Faculty of Medicine of Nancy.
" " " " Rio de Janeiro.
" " " " Toulouse.

One thousand and seven inaugural dissertations have been received.

Of the 745 new books added to the Library, 46 were written or edited by Fellows of the College, and 26 were presented by the following authors:

Dr. A. C. Abbott,	Dr. O. G. T. Kiliani,
Dr. J. M. Batten,	Dr. H. C. Knapp,
Dr. H. G. Beck,	Dr. C. K. Mills,
Dr. H. W. Cattell,	Dr. William Osler,
Dr. S. V. Clevenger,	Dr. Boardman Reed,
Dr. A. C. Croftan,	Dr. G. C. Savage,
Dr. G. M. Edebohls,	Dr. Jay F. Schamberg,

Dr. F. Erben,
Dr. J. M. French,
Dr. J. Friedenwald,
Dr. G. M. Gould,
Dr. H. A. Hare,
Dr. Bayard Holmes,
Dr. W. W. Keen,
Dr. J. Madison Taylor,
Dr. James Tyson,
Dr. W. M. Welch,
Dr. William H. Wells,
Dr. H. E. Wetherill,
Dr. Walter Whitehead.

Twenty volumes were sent by the publishers at the request of the following authors:

Dr. J. M. Anders,
Dr. Astley P. C. Ashhurst,
Dr. L. Napoleon Boston,
Dr. J. C. Da Costa, Jr.,
Dr. John B. Deaver,
Dr. Barton Cooke Hirst,
Dr. James W. Holland,
Dr. C. H. La Wall,
Dr. Henry Leffmann,
Dr. S. Weir Mitchell,
Dr. Walter L. Pyle,
Dr. J. L. Salinger (translator),
Dr. J. Henry C. Simes (translator),
Dr. H. W. Stelwagon,
Dr. James C. Wilson,
Dr. H. C. Wood,
Dr. James K. Young.

The "Donors" during the year number 289. Those who presented 25 volumes or more are:

Board of Managers, Episcopal Hospital, Phila.	1982	volumes
Dr. James V. Ingham	548	"
Dr. William B. Atkinson	220	"
Dr. S. McC. Hamill	150	"
Dr. Hobart Amory Hare	111	"
Dr. William S. Wray	103	"
Dr. John B. Roberts	92	"
Dr. G. C. Harlan	82	"
Estate of Mordecai Price, M.D.	61	"
Dr. A. O. J. Kelly	55	"
Bureau of Health, Phila.	54	"
Dr. Robert N. Willson, Jr.	30	"
Dr. Elliston J. Morris	27	"
Dr. Joseph McFarland	26	"
From the Publishing houses of		
P. Blakiston's Son & Co.	37	"
F. A. Davis Company	11	"
Lea Brothers & Company	9	"
J. B. Lippincott Company	23	"
W. B. Saunders & Company	38	"
William Wood & Company	1	"

A great number of pamphlets and journals were presented by the following:

O. H Allis,
Wm. B. Atkinson,
L. Brinkmann,
Burton Chance,
Stricker Coles,
E. P. Davis,
W. A. N. Dorland,
C. W. Dulles,
A. A. Eshner,
H. M. Fisher,
C. H. Frazier,
S. McC. Hamill,
H. A. Hare,
G. C. Harlan,
C. J. Hatfield,
F. P. Henry,
W. W. Keen,
A. O. J. Kelly,
H. H. Kynett,
R. G. Le Conte,
L. Eindauer,
Joseph McFarland,
R. P. McReynolds,
Edward Martin,
A. V. Meigs,
J. K. Mitchell,
S. Weir Mitchell,
E. J. Morris,
C. P. Noble,
W. H. Noble,
C. A. Oliver,
F. R. Packard,
W. E. Parke,
J. B. Roberts,
A. E. Roussel,
C. E. de M. Sajous,
P. J. Sartain,
G. E. de Schweinitz,
J. Alison Scott,
J. B. Shober,
Wharton Sinkler,
Rachel S. Skidelsky,
J. M. Swan,
J. Gurney Taylor,
J. J. Taylor,
William Thomson,
H. R. Wharton,
J. William White,
J. C. Wilson,
A. C. Wood,
H. C. Wood, Jr.
Bureau of Health of Philadelphia.
Board of Managers of the Episcopal Hospital, Philadelphia.
J. B. Lippincott Company.
Philadelphia Polyclinic.

The amounts expended for the purchase of books by the various Funds are as follows:

Henrietta Rush Fales Baker Fund, 75 volumes	$206 33
Luther S. Bent Fund, 17 volumes	30 80
William T. Carter Fund, 87 volumes	171 86
John D. Griscom Fund, 97 volumes	290 28
William F. Jenks Fund, 88 volumes	287 85
Oliver A. Judson Fund, 12 volumes	49 42
Wm. V. and John M. Keating Fund, 20 volumes	59 90

William W. Keen Fund, 112 volumes	$346 53
Library Endowment Fund, 159 volumes	655 82
S. Weir Mitchell Fund, 62 volumes	199 30
Philadelphia Medical Society Fund, 4 volumes	58 42
Lewis Rodman Fund, 37 volumes	152 37
John F. Weightman Fund, 24 volumes	39 07
Caspar Wistar Fund; 54 volumes	196 81

Special Accounts:

Fund for completing files of journals, 200 volumes	85 94
Journal Association, 23 volumes (about)	115 00
New Book Fund, 43 volumes	110 67
J. Ewing Mears Account, 23 volumes	72 50
S. D. Gross Library Account, 50 volumes	135 16

From the George B. Wood Library Fund $185 has been expended for library supplies, stationery, etc.

One thousand six hundred and thirty-six volumes have been bound.

There have been 6506 visits to the Library recorded. 16,847 volumes have been consulted beside those taken directly from the shelves by Fellows of which no record can be kept. 4826 books have been taken out.

Three thousand eight hundred and seventy-four works and one thousand six hundred and eighteen volumes have been catalogued and nine thousand eight hundred and forty-two cards have been written during the year.

All books and the more important pamphlets received during the year have been catalogued, and the work on old pamphlets bound in volumes is progressing satisfactorily. 29,099 pamphlets have been examined, 14,686 of which have been classified, and 14,413 thrown out as duplicates.

Nineteen thousand eight hundred and twenty-three cards have been revised, typewritten, and indexed during the year.

Formerly the supervision of the Revision of the Catalogue was left to the cataloguer, but since early in 1902 the cataloguing of accessions and the revision have been done under the immediate direction of the Librarian, and it is believed that the work is as accurate as it is possible for it to be. 82,931 cards have been typewritten and are in use. We are proud of our catalogue so far as it has gone, and are most anxious to complete it according to the same high standard. To do this will require about four more years of work and three thousand five hundred dollars. Up to November 1, $2967 has been expended on the work; $2190 for salaries, $675 for three cases and cards, and $102 for typewriting machine and desk. Of this amount $1800 was collected by the Committee that the College appointed to obtain subscriptions, and $1167 was appropriated from the funds of the Library Committee. The Committee are loath to diminish the current income for the purchase of books

to meet this extra expense for permanent betterment, but feel that it would be expedient to appropriate $500 more for this purpose. The remaining $3000 of the amount estimated as necessary to complete the revision they hope to obtain by subscriptions, and will ask the College to authorize the Librarian to solicit them.

The Library is in excellent condition, though Fellows who use it will understand how hard it is to keep it so. Books are crowded on the tops of those standing on the shelves, and to keep them free from injury and accessible to readers is, under present conditions, a most difficult task, which may become impossible in the near future. Your Committee would therefore once more express the hope that the time when adequate space for the storing and care of books will be provided may not be much longer delayed.

The accompanying balance sheet of the Treasurer shows the receipts and expenditures.

The current expenses of the Library, aside from the purchase of books, for the coming year are estimated at $5649.

GEORGE C. HARLAN, M.D., ,
Chairman.

LIST OF PAPERS: SECTION ON OPHTHALMOLOGY.

December, 1904.

Binasal Hemianopsia, by Dr. William T. Shoemaker.

Recurrent Oculomotor Palsy, by Drs. Wm. G. Spiller and Wm. Campbell Posey.

Extirpation of the Lachrymal Sac, by Drs. G. E. de Schweinitz and C. M. Hosmer (by invitation).

Sarcoma of the Orbit, by Dr. G. Oram Ring.

The Ophthalmic Subjects Treated of in the Code of Hammurabi, by Dr. Charles A. Oliver.

A Case of Congenital Defect of Abduction Associated with Retraction of the Eyeball, by Dr. John T. Carpenter.

January, 1905.

Exhibition of a Case of Keratitis Disciformis, by Dr. Wm. Campbell Posey.

A Case of Gunshot Wound of the Orbit, by Dr. Wm. Campbell Posey.

Double Blepharoplasty for the Cure of Cicatricial Ectropion, by Dr. Wm. Campbell Posey.

Simultaneous Contrast Color Images, by Dr. Charles A. Oliver.

Treatment of Infection Following Cataract Extraction, by Dr. H. F. Hansell.

Double Perforation of the Sclera by a Foreign Body, by Dr. William M. Sweet.

A Case of Papilloma of the Lachrymal Caruncle, by Dr. C. A. Veasey.

A Case of Leukosarcoma of the Choroid with Secondary Involvement of the Ciliary Body, by Dr. C. A. Veasey.

Blocking of the Sympathetics of the Anterior Segment of the Eyeball, by Dr. William Zentmayer.

Exhibition of a Case of Papilloma of the Conjunctiva, by Dr. B. Alex. Randall.

February, 1905.

The Treatment of Internal Ocular Inflammations with Diaphoresis, by Dr. H. F. Hansell.

Astigmatism after Simple Extraction, as Modified by the Conjunctival Flap, by Dr. C. F. Clark, of Columbus, Ohio (by invitation).

A Case of Paralysis of the Upward Movements of Both Eyes, by Dr. William Zentmayer.

A Case of Traumatic Aniridia, by Dr. G. E. de Schweinitz.

Exhibition of Macroscopic and Microscopic Specimens from Three Cases of Sarcoma of the Choroid and One of Glioma of the Retina, by Drs. G. E. de Schweinitz and B. F. Baer, Jr. (by invitation).

Exhibition of a New Ophthalmic Outfit for Bedside Examination, by Dr. Edward A. Shumway.

March, 1905.

Exhibition of a Case of Purulent Inflammation of the Frontal and Ethmoidal Sinuses, Simulating Disease of Lachrymal Sac, by Dr. William M. Sweet.

Unusual Changes in Refraction, by Dr. S. D. Risley.

Epiphora Unassociated with Lachrymal Obstruction, by Dr. John T. Carpenter.

Concerning Metastatic Ophthalmitis, by Dr. G. E. de Schweinitz.

Nitric Acid Burn Involving the Whole External Portion of the Eyeball, by Dr. C. A. Veasey.

April, 1905.

Exhibition of a Case of Dermoid Tumor of the Bulbar Conjunctiva, by Dr. S. D. Risley.

Exhibition of a Case of Removal of the Transparent Lens for High Myopia, by Dr. S. D. Risley.

Exhibition of a Case of Removal of the Transparent Lens for High Myopia, by Dr. Wendell Reber (by invitation).

Exhibition of a Case of Radial Tear in the Iris, by Dr. Edward A. Shumway.

Subdivision of the Visual Cortex with Remarks on Cortical Color Centres, by Dr. Charles K. Mills.

Conjunctival Irritation, Excited by Proximity to a Horse, by Dr. Wm. Campbell Posey.

A Case of Mikulicz's Disease, by Dr. S. Lewis Ziegler.

Some Lesions of High Myopia, by Dr. H. F. Hansell.

October, 1905.

Exhibition of a Case of Spontaneous Dislocation of the Eyeball, by Dr. George C. Harlan.

Common Ocular Complications of Hysteria, by Dr. Edward A. Shumway.

Disease of the Bulbar Conjunctiva, Presumably Tubercular, by S. D. Risley.

November, 1905.

Concerning the Pathway of Certain Post-operative Infections, by Drs. G. E. de Schweinitz and C. M. Hosmer (by invitation).

Ocular Injuries from Glass and Stone, by Dr. William M. Sweet.

Chancre of the Eyelid with Interstitial Keratitis, by Dr. John T. Carpenter.

Exhibition of Two Cases of Triangular Opacity in the Superficial Layers of the Cornea, by Dr. Wm. Campbell Posey.

Exhibition of a Case of Supposed Tubercular Keratitis, by Dr. Wm. Campbell Posey.

Exhibition of a Case of Buphthalmos, by Dr. Wm. Campbell Posey.

Exhibition of a Case of Dendritic Keratitis, by Dr. Edward A. Shumway.

Exhibition of a Case of Interstitial Keratitis Due to Acquired Syphilis, by Dr. Edward A. Shumway.

Membranous Occlusion of the Pupil, by Dr. S. Lewis Ziegler.

Leukosarcoma of the Choroid and Ciliary Body, by Drs. G. E. de Schweinitz and C. M. Hosmer (by invitation).

A Case of Double Persistent Hyaloid Canal, by Dr. H. F. Hansell.

The Symptoms of Ametropia, by Dr. H. F. Hansell.

Acute Retrobulbar Neuritis, Probably Due to Sinusitis, by Dr. Wm. Zentmayer.

LIST OF PAPERS: SECTION ON OTOLOGY AND LARYNGOLOGY.

December 21, 1904.

Dr. Frank Woodbury addressed the Section on "Nasal Hemorrhoids; Recurrent Epistasis due to Vascular Growths on the Septum Nasi, with Specimens."

Dr. W. G. B. Harland read a paper entitled "Remarks upon the Teaching and Treatment of the Ear and Throat at Harvard."

Dr. John M. Mackenzie, of Baltimore, addressed the Section on "The Laryngeal Neoplasms of Tuberculosis."

January 18, 1905.

Dr. G. M. Marshall read a paper entitled "An Extensive Lupus Ulceration of the Nose."

Dr. Walter Roberts made some remarks on "The Mastoid Incision," with exhibition of a case.

Dr. E. L. Vansant showed "A Syringe for the Treatment of Diseases of the Accessory Sinuses."

Dr. D. Braden Kyle "Demonstrated the Method of Teaching by means of the Stereopticon."

Dr. D. Braden Kyle reported "A Case of Complete Adhesion of the Vocal Bands."

February 15, 1905.

Dr. P. S. Donnellan reported (1) "A Case of Leukoplakia Buccalis." (2) "Specific Pharyngitis complicated with Peritonsillar Abscess."

Dr. W. G. E. Harland presented a case illustrating "The Cosmetic Use of Paraffin in changing the Shape of the Nose."

March 15, 1905.

Dr. G. M. Marshall read a paper entitled "A Case of Clonic Spasm of Laryngeal and Pharyngeal Muscles, following Cranial Injury, exhibition of case."

Dr. Franklin B. Royer, of Philadelphia, read a paper entitled "The Complications and Sequelæ met with in Laryngeal Diphtheria," with exhibition of cases and specimens.

April 19, 1905.

Dr. Barton H. Potts reported (1) "An Undeveloped Frontal Sinus." (2) "A Foreign Body in the Maxillary Antrum."

Dr. George B. Wood showed "Specimens illustrating the Lymphatic Drainage of the Tonsils."

May 17, 1905.

Dr. D. Braden Kyle presented a case of "Angioma of the Nasopharynx."

October 18, 1905.

Dr. B. A. Randall gave an address on "Some Remarks on Labyrinthine Deafness."

Dr. W. G. B. Harland read a paper entitled "The Submucous Resection of the Nasal Septum."

Dr. J. L. Harkness (by invitation) read a paper entitled "A Tumor of the Throat."

November 15, 1905.

Dr. C. W. Richardson, of Washington, D. C., read a paper entitled "Acute Mastoiditis."

F. R. Packard,
Clerk.

LIST OF PAPERS: SECTION ON GENERAL MEDICINE.

December, 1904.

The Complications of Lobar Pneumonia, by James M. Anders.

Some Remarks upon the Diagnosis of Heart Disease: (1) The Study of the Apex Beat; (2) The Relative Value of the Superficial and the Deep Cardiac Dulness; and (3) The Relative Value of Percussion and Auscultation, by A. O. J. Kelly.

The Gastric Contents in Lead Poisoning, by Joseph Sailer and John M. Speese.

January, 1905.

A Case of Acromegaly in a Roumanian, by Clifford B. Farr.

The Pathological Study of Acute Myelitis with a Report of Two Cases, by John H. W. Rhein.

The Use of Theosin and Theosin Sodium Acetate as Diuretics, by Hermann B. Allyn.

A Study of Fifty Cases of Perforation in Typhoid Fever, with Conclusions Based upon Ten or More Cases Supposed to be Perforative, but Proven Otherwise, by J. Alison Scott. The discussion was opened by William Osler, of Baltimore.

A Sarcoma of the Liver, exhibited by John M. Cruice.

February, 1905.

A Patient Recovered from Pyopneumothorax after Spontaneous Evacuation through a Bronchus and Subsequent Resection of a Rib, by A. O. J. Kelly.

A Patient with Aortic Insufficiency Presenting an Unusually Loud Musical Murmur, by A. A. Eshner.

A Case of Universal Congenital Atrichia, by A. A. Eshner.

Polycythemia and Cyanosis, with a Report of Two Cases, by Joseph Sailer, H. D. Geisler, and E. M. Welty.

Paratyphoid Fever, with a Report of Six Cases, by J. Norman Henry.

Diet in Typhoid Fever, by T. L. Coley.

March, 1905.

A Case of Tuberculous Meningitis Following Trauma in a Patient Ill with Tuberculosis of the Kidney, and Giving a Positive Widal Reaction, by Alfred Stengel.

A Case of Carbon Disulphide Poisoning, by A. P. Francine.

April, 1905.

A Case of Paroxysmal Hæmatinuria, by H. A. Hare.

A Case of Achylia Gastrica and Chronic Interstitial Nephritis, by J. Dutton Steele.

Two Cases of Dextrocardia Occurring in Pulmonary Tuberculosis, by A. P. Francine.

A Series of Cases of Carcinoma of the Intestine, by Joseph Sailer.

May, 1905.

A Case of Typhoid Fever with Divers Complications, including Perichondritis from which the Typhoid Bacillus was Isolated One Year after the Attack of Typhoid Fever, by Alfred Hand.

A Case of Typhoid Fever, with Sudden Onset, with Chills and Symptoms Suggesting Influenza, by Alfred Hand.

A Case of Multiple Neuritis (Toe-drop) Following Typhoid Fever, by Alfred Hand.

Hypertrophic Pulmonary Osteoarthropy in Pulmonary Tuberculosis, by H. R. M. Landis.

The Value of Kernig's Sign, by R. N. Willson.

The Significance of the Analysis of the Gastric Contents, by Clifford B. Farr and William B. Cadwalader.

A Comparison of the Agglutinating Properties of Typhoid Fever Sera with Bacillus Typhosus, Bacillus Paratyphosus (A), and Bacillus Enteritidis (Gaertner), with Reference to their Individual Antisera, by Herbert Fox.

October, 1905.

Obliterative Pericarditis, by Joseph Sailer.

The Diagnosis of Acute Pancreatitis, by James C. Wilson.

A Case of Stokes-Adams Syndrome, by Alfred Stengel.

The Position and Size of the Heart in Advanced Mitral Stenosis, by M. Howard Fussell.

The Clinical Examination of the Feces, by J. Dutton Steele.

Tuberculosis of the Liver, by Joseph Sailer.

November, 1905.

The Medical versus the Surgical Treatment of Diseases of the Stomach, by Frank Billings, of Chicago.

The Indications for Surgical Intervention in Diseases of the Stomach in the Absence of Symptoms of Perforation or Hemorrhage, by George E. Brewer, of New York.

The Relation of Carcinoma to Ulcer of the Stomach, especially as Influencing the Treatment of Ulcer, by John H. Musser.

The Final Results of Operations, such as Gastroenterostomy, pyloroplasty, etc., in the Treatment of Diseases of the Stomach, by John B. Deaver.

Certain Therapeutic Indications Based upon the Presence of Occult Blood in the Gastric Contents and the Feces, by J. Dutton Steele.

A. O. J. KELLY,
Clerk.

LIST OF PAPERS: SECTION ON GYNECOLOGY.

January 19, 1905.

Secondary Metastatic Implantation of Carcinoma in the Vagina, by E. A. Schumann (by invitation).

Vaginal Atresia Complicating Labor, by J. C. Hirst.

The Use and Abuse of the Uterine Curette, by R. P. McReynolds.

March 16, 1905.

Congenital Heart Disease, by G. M. Boyd and A. G. Ellis (latter by invitation).

Hysterectomy for Fibroid of the Uterus, by J. B. Deaver.

Paraplegia Complicating Pregnancy, by A. P. Berg (by invitation).

Sarcomatous Degeneration of a Fibroid Tumor of the Uterus with Repeated Hemorrhages into the Tumor, by T. A. Erck.

May 18, 1905.

Prevention of Maternal Morbidity following Pregnancy, by Striker Coles.

Glandular Metastases in Carcinoma Uteri, by J. G. Clark.

October 19, 1905.

Pseudomyxoma Peritonei, by B. C. Hirst.

Appendicitis Complicating Pregnancy, by E. P. Davis.

W. R. Nicholson,
Clerk.

LIST OF PAPERS: SECTION ON MEDICAL HISTORY.

April 24, 1905.

Æsculapian and Modern Health Resorts Compared, by Dr. Roland G. Curtin.

Lantern Slides Illustrating the Early History of the Medical Department of the University of Pennsylvania, by Dr. William Pepper.

The Most Eminent American Physician of European Birth, by Dr. A. Jacobi, of New York.

November 29, 1905.

Joseph Roby, the Anatomist, by Dr. Eugene F. Cordell, of Baltimore.

A Sketch of the Life of Dr. Thomas Bond, by Dr. J. Alison Scott.

Some Autograph Letters of Early Philadelphia Physicians, by Dr. William Pepper.

WILLIAM PEPPER,
Clerk.

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